Vol. 9 No. 1 September 2025

ISSN : 2597-8713 (ONLINE)
ISSN : 2598-5167 (PRINT)
Agricultural Science

AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

The Effect of Nitrogen Fertilizer Dosage on The Growth and Yield of Balsam (*Impatiens balsamina L.*)

Tri Diana[1], Riski Nurfadillah[1], Helda Valentinadia[1], Siti Wahyuni[1]*

[1]Faculty of Agriculture, Swadaya Gunung Jati University, Cirebon, Indonesia

*Correspondence Email: sitiwahyuni@ugj.ac.id

Article History: Received: May 15, 2025; Accepted: July 25, 2025

ABSTRACT

This study aims to determine the effect of various doses of nitrogen fertilizer on the growth and yield of impatiens (Impatiens balsamina L.). The study was conducted in Bandorasa Village, Cilimus District, Kuningan Regency, using a randomized block design (RBD) with seven treatments of nitrogen fertilizer doses, ranging from 1 g to 4 g of urea per polybag. The parameters observed included root length, plant height, number of leaves, leaf area, net assimilation rate, plant growth rate, chlorophyll content, number of flowers, fresh flower weight, and anthocyanin and carotenoid content. The results showed that nitrogen fertilizer application had a significant effect on several parameters, particularly plant height, number and area of leaves, plant growth rate, and number and weight of flowers. The 2.5 g/polybag dose treatment yielded the best results for most parameters, while excessively high doses tended to reduce growth and flowering efficiency. This study concluded that applying nitrogen fertilizer at the appropriate dose is crucial for optimizing the growth and yield of *Impatiens balsamina L.*

Keywords: Anthocyanin, Nitrogen dosage, Impatiens balsamina, Urea

1. INTRODUCTION

Impatiens balsamina L. included in the family *Balsaminaceae*is a popular ornamental plant known for its striking flower colors ranging from red, purple, white, to orange, and its adaptability to various environmental conditions. This plant thrives in open areas, especially in tropical regions, and cannot survive in dry areas. Balsam plant typically grows in lowlands up to an altitude of 1,250 meters above sea level (Rahmawati et al., 2021).

Information on the cultivation and use of the balsam plant in Indonesia is still not widely researched, so the information obtained is very limited. The benefits of the balsam plant plant can be used as an alternative medicine to treat diseases. Balsam plant seeds contain saponins, fixeloil, and quercetin. Saponins function as antibacterials (Made et al., 2015). Balsam plant leaves contain coumarin, flavonoids, quinones, saponins and steroids. The roots contain cyanidin monoglycosides (Syamsul et al., 2012). Meanwhile, the balsam plant flower produces a brownish-red pigment related to the chemical content contained therein, namely anthocyanin, delphinidin, quercetin, pelargonidin, malvidin, kaempferol and cyaniding aminoglycoside, these contents play an

DOI: https://doi.org/10.55173/agriscience.v9i1.175

ISSN : 2597-8713 (ONLINE)
ISSN : 2598-5167 (PRINT)
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

important role as natural dyes (Alimuddin, 2016). Anthocyanins can be used as good antioxidants that act as antivirals and antimicrobials.

One of the main problems in balsam plant cultivation is a lack of public awareness of its economic benefits and suboptimal cultivation techniques. Consequently, balsam plant is still considered a wild plant and is not widely cultivated commercially. Most balsam plants are found growing wild in yards, vacant lots, or roadsides, without any targeted cultivation practices, resulting in suboptimal growth. During the vegetative phase, this affects the growth of roots, stems, and leaves, which indirectly impacts generative growth. Furthermore, insufficient attention to fertilization also impacts the quality of the flowers produced, which tend to result in uneven and less attractive colors (Adrianingtyas, 2024).

Growth factors are crucial in the plant growth process. These factors include both internal and external factors. Internal factors that can influence plant growth include genes and plant hormones, while external factors include nutrients, growing media, temperature, air humidity, water, and light intensity (Sigit & Pamungkas, 2018). Of the several important factors in successful plant growth, nutrients are one that requires further study.

Nutrient addition can be increased through fertilization. Fertilization is a crucial component in balsam plant cultivation, which can increase crop production. Fertilization provides the plants with the necessary nutrients, thereby accelerating the flowering and fruiting processes, ultimately increasing yields, both in terms of quantity and quality. Therefore, efforts are needed to increase yields by administering the correct fertilizer dosage. Urea is an appropriate fertilizer and is widely used by farmers due to its high nitrogen (N) content of 46% (Irwanto et al., 2021).

Urea fertilizer is the right solution to improve the growth and quality of balsam plants. Urea fertilizer is included in the single inorganic fertilizer containing the nutrient N. Nitrogen is an essential nutrient that plays a role in the composition of amino acids, proteins, and chlorophyll pigments that play an important role in the process of photosynthesis. Nitrogen is mobile in plants, meaning that functional proteins containing Nitrogen (N) can be broken down in older plant parts, then transported to young, actively growing tissues (Tando, 2018). The need for nitrogen in the generative phase is not as much as in the vegetative phase, so that maximum nitrogen absorption occurs in the vegetative phase and begins to decline when entering the generative phase. Adequate nitrogen availability supports the optimal formation of vegetative plant parts, because meristem tissue that actively divides, elongates, and enlarges requires nitrogen in the process of forming new cell walls.

DOI: https://doi.org/10.55173/agriscience.v9i1.175

ISSN : 2597-8713 (ONLINE)
ISSN : 2598-5167 (PRINT)
Agricultural Science
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

Nitrogen deficiency can inhibit plant growth and development, as well as reduce crop yields, due to disruption of chlorophyll formation, which is crucial for photosynthesis. Excessive urea (nitrogen) content results in environmental damage such as groundwater pollution, eutrophication and water toxicity, decreased soil quality, damage to biodiversity, and can even harm human health (Irwanto et al., 2021). Furthermore, excess N will stimulate vegetative growth, high photosynthesis rates, and high CH2O utilization, which can inhibit plant maturity, cause tissue to become succulent, cause plants to fall over, and become susceptible to disease. Furthermore, excessive amounts can also inhibit flowering and fruiting (Miarti & Legasari, 2022). The analysis showed that administering various doses of nitrogen fertilizer as a nitrogen source significantly impacts plant height and leaf number in the vegetative phase. (Nugroho, 2015) stated that increasing the dose of N fertilizer affects the generative phase, which tends to increase plant fresh weight.

The use of nitrogen fertilizer on balsam plants requires further study. Research is needed to determine the appropriate dosage and its impact on balsam plant growth and yield. This will hopefully lead to the discovery of the optimal dosage for optimal growth and yield.

2. MATERIALS AND METHODS

The research was conducted in Bandorasa Village, Cilimus District, Kuningan Regency from May to July 2025. The experimental location is located at an altitude of 600 m above sea level (asl). The tools used were hoes, rulers, scales, stationery, cameras, lux meters, spectrometers, spectrophotometers, HTC-2. The materials used were balsam flower seeds, soil, husks, manure, nitrogen fertilizer, distilled water, plastic, seedling polybags measuring (10cm x 10cm), and polybags measuring (25cm x 25cm) for transplanting.

The research was conducted using an experimental method with a quantitative approach. The design used was a Randomized Block Design (RAK) with seven different doses of Nitrogen fertilizer, namely: P1 (1 g/polybag of Urea fertilizer), P2 (1.5 g/polybag of Urea fertilizer), P3 (2 g/polybag of Urea fertilizer), P4 (2.5 g/polybag of Urea fertilizer), P5 (3 g/polybag of Urea fertilizer), P6 (3.5 g/polybag of Urea fertilizer) and P7 (4 g/polybag of Urea fertilizer). Each treatment was repeated 4 times, resulting in 28 experimental units. Each treatment consisted of 10 polybags. So the total number of polybags was 280 polybags.

The research procedure begins with the preparation of the planting medium, which is divided into seedling and nursery planting media. The seedling planting medium has a composition

DOI: https://doi.org/10.55173/agriscience.v9i1.175

ISSN : 2597-8713 (ONLINE)
ISSN : 2598-5167 (PRINT)
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

of 2:1, that is, every 2 sacks of soil are mixed with 1 sack of rice husks. The soil and rice husks are then mixed and then put into each 10cm x 10cm seedling polybag. The planting medium for nurseries has a composition of 2:1:1, that is, every 2 sacks of soil are mixed with 1 sack of rice husks and manure which are put into 25cm x 25cm polybags, followed by seedling preparation, planting, watering, fertilizing, weeding, integrated pest control, and harvesting. Observations consist of root length, plant height, number of leaves, leaf area, net assimilation rate, plant growth rate, chlorophyll content, number of flowers, fresh flower weight, and anthocyanin content.

The experimental data were analyzed using the F test in the analysis of variance. If the tested treatment showed a real effect, then the test was continued with the DMRT test (*Duncan Multiple Range Test*) at the 5% level, further testing was carried out using SPSS.

3. RESULTS AND DISCUSSION

Root Length

Root length was measured at the time of observation. Root length measurement started from the root base to the root tip. Statistical analysis results showed that different doses of nitrogen fertilizer had no significant effect on root length at all observation ages. Statistical analysis results are presented in Table 1.

Table 1. Effect of Nitrogen Dose on Root Length Parameters

Treatment	Root length (cm)		
	21 HST	28 HST	35 HST
P1 (1 g/polybag)	5,0000 a	8,7500a	16,2500 a
P2 (1,5 g/polybag)	4,8750 a	8,2500 a	19,2500 a
P3 (2 g/polybag)	5,5000 a	7,0000 a	9,7500 a
P4 (2,5 g/polybag)	6,1250 a	6,6250 a	14,0000 a
P5 (3g/polybag)	6,2500 a	6,5000 a	14,6250 a
P6 (3,5 g/polybag)	4,8750 a	6,2500 a	10,2500 a
P7 (4g/polybag)	4,2500 a	5,2500 a	10,6250 a

Description: The average number followed by the same letter in the same column shows no significant difference according to Duncan's test at the 5% level.

Root length is an important indicator in determining a plant's ability to absorb water and nutrients from the soil. Based on the statistical analysis in the table above, the application of different doses of nitrogen fertilizer did not have a significant effect on the root length of balsam plants at all observation times (21, 28, and 35 HST). This is likely because all treatments already met the minimum nitrogen requirements for root growth, so additional nitrogen from higher doses

DOI: https://doi.org/10.55173/agriscience.v9i1.175

ISSN : 2597-8713 (ONLINE)
ISSN : 2598-5167 (PRINT)
Agricultural Science
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

did not significantly increase root length but may have been stored or redirected for above-ground growth such as the canopy, leaves, and stems. In line with Ardi Asroh's (2019) research, which stated that nitrogen fertilizer application had no significant effect on root length and dry root weight in lettuce plants, it is suspected that the nitrogen nutrients contributed by urea fertilizer are more dominant in promoting vegetative growth of the canopy compared to root growth.

Roots absorb nitrogen starting from the upper soil layer, then continue to deeper layers in the root zone until the plant's needs are met. In each soil layer, nitrogen absorption occurs through mass flow mechanisms and active absorption processes (Priambodo, 2021). Physiologically, roots absorb nitrogen in the form of nitrate (NO_3^-) and ammonium (NH_4^+), which are then used for the synthesis of amino acids, proteins, and other important compounds in plant metabolism. In addition to nitrogen, phosphorus nutrients are also present in the soil, which can help stimulate root growth.

Plant Height (cm)

Plant height measurements began at 21 days after planting and continued until the plants were 35 days old. The height of balsam plants was measured from the soil surface to the tip of the plant stem. Statistical analysis showed that different doses of nitrogen fertilizer had a significant effect on plant height at all observation ages. The results of the statistical analysis are presented in Table 2.

Table 2. Effect of Nitrogen Dose on Plant Height

Treatment	Plant Height (cm)		
	21 HST	28 HST	35 HST
P1 (1 g/polybag)	6,2500 a	10,125 a	22,375 ab
P2 (1,5 g/polybag)	6,3750 a	11,250 ab	24,750 abc
P3 (2 g/polybag)	8,2500 a	13,750 bc	25,875 bc
P4 (2,5 g/polybag)	10,5000 b	14,625 c	30,375 c
P5 (3g/polybag)	8,0000 a	13,250 bc	27,875 bc
P6 (3,5 g/polybag)	7,8750 a	10,125 ab	22,250 ab
P7 (4g/polybag)	6,3750 a	9,875 a	19,250 a

Description: The average number followed by the same letter in the same column shows no significant difference according to Duncan's test at the 5% level.

Based on the statistical analysis in Table 2, the application of nitrogen fertilizer at various doses had a significant effect on the height of balsam plants at 21, 28, and 35 days after sowing (DAS). The application of nitrogen fertilizer at a dose of 2.5 g/polybag consistently showed better plant height growth and was significantly different from treatments P1, P6, and P7. This is likely

DOI: https://doi.org/10.55173/agriscience.v9i1.175

ISSN : 2597-8713 (ONLINE)
ISSN : 2598-5167 (PRINT)
Agricultural Science
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

because the P4 treatment supports active cell elongation and contains components such as auxin. This aligns with Ichsan Fauzi's (2021) research, which states that nitrogen is one of the components of auxin, and auxin plays a role in the growth of apical meristem tissue, causing plants to grow taller.

Diyah & Satyana (2021) state that urea fertilizer is required by plants for the growth of vegetative parts such as leaves, stems, and roots. However, when the dose is increased beyond the amount required by the plant (such as in P5 to P7), there is no significant increase in plant height, and it may even decrease. This decrease is suspected to be caused by the accumulation of excessive nitrogen that is not balanced by an increase in cell elongation activity. Excessive nitrogen can disrupt the balance of plant hormones such as auxin and gibberellin, which play a crucial role in the cell elongation process. As a result, despite sufficient nitrogen availability, the plants did not show significant height increases. This phenomenon aligns with the Law of Diminishing Returns, which explains that continuous input increases do not always lead to yield improvements and may even decrease beyond the point of maximum efficiency.

Plants also require other nutrients besides nitrogen for growth. These other nutrients are provided in organic fertilizers contained in the growing medium. Chairiyah et al. (2022) state that phosphorus (P) plays a crucial role in photosynthesis, particularly because it is involved in ATP formation. This ATP contributes to the vegetative growth of chili plants, such as increased plant height. Meanwhile, the application of potassium (K) can stimulate the development of meristematic tissue. Increased meristematic tissue supports carbohydrate synthesis, and the carbohydrates formed subsequently strengthen meristematic tissue activity. This has a positive overall impact on vegetative growth, including plant height.

Number of Leaves (sheets)

Leaves are very important plant organs because they function as the site of photosynthesis. Statistical analysis shows that different doses of nitrogen fertilizer have a significant effect on the number of leaves at 28 days after planting. The results of the statistical analysis are presented in Table 3.

DOI: https://doi.org/10.55173/agriscience.v9i1.175

ISSN : 2597 - 8713 (ONLINE)
ISSN : 2598 - 5167 (PRINT)
Agricultural Science
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

Table 3. Effect of Nitrogen Dose on Leaf Number Parameter

Treatment	Number of Leaves (sheets)		
	21 HST	28 HST	35 HST
P1 (1 g/polybag)	8,00 a	20,500 ab	76,50 a
P2 (1,5 g/polybag)	8,25 a	36,750 cd	100.00 a
P3 (2 g/polybag)	9,25 a	38,250 d	97,00 a
P4 (2,5 g/polybag)	10,25 a	26,500 bc	90,75 a
P5 (3g/polybag)	8,75 a	27,750 bc	90,00 a
P6 (3,5 g/polybag)	7,75 a	15,500 a	65,50 a
P7 (4g/polybag)	7,50 a	13,500 a	64,50 a

Description: The average number followed by the same letter in the same column shows no significant difference according to Duncan's test at the 5% level.

Based on the statistical analysis in Table 3, it can be seen that at 28 HST, treatment P3 (2 g/polybag) was significantly different from the other treatments. This indicates that a fertilizer dose of 2 g/polybag is sufficient to meet the nitrogen requirements for the growth process of balsam plants. This aligns with Masluki (2015), who states that nitrogen fertilizer absorbed in quantities appropriate to the plant's needs can fulfill the required nutrient requirements, as nitrogen nutrients can accelerate vegetative growth in plants.

Sutari (2016) states that nitrogen functions to increase the number of leaves, expand leaf size, increase stem diameter, and lengthen internodes, which collectively contribute to increased plant biomass weight. Nitrogen plays a crucial role in the formation of vegetative tissues, including leaves, as it is absorbed in the form of NO_3^- (nitrate) and NH_4^+ (ammonium) through the roots and distributed throughout the plant via the xylem. This nutrient is essential for the formation of amino acids, proteins, and chlorophyll, which support cell division (mitosis) in the meristematic tissues of shoots and leaves. The number of leaves formed is also influenced by genetic factors (Juwaningsih et al., 2022).

In addition to nitrogen, the presence of additional nutrients such as phosphorus (P) and potassium (K) from manure in the growing medium also supports leaf formation. Phosphorus plays an important role in the formation of energy (ATP) required in the metabolic process for the formation of amino acids, starch, fats, and other organic compounds. Potassium helps regulate plant physiological processes such as stomatal opening and closing, transport of photosynthesis products, and increases the strength of plant tissues such as leaves, flowers, and fruits so that they do not easily fall off (Kurniawati & Karyanto, 2015).

DOI: https://doi.org/10.55173/agriscience.v9i1.175

ISSN : 2597-8713 (ONLINE)
ISSN : 2598-5167 (PRINT)
Agricultural Science
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

Leaf Area (cm^2)

Statistical analysis shows that different doses of nitrogen fertilizer have a significant effect on leaf area at 28 days after planting. The results of the statistical analysis are presented in Table 4.

Table 4. Effect of Nitrogen Fertilizer Dose on Leaf Area Parameters

Treatment	Leaf Area (cm^2)		
	21 HST	28 HST	35 HST
P1 (1 g/polybag)	19,7475 a	218,2375 b	917,2875 a
P2 (1,5 g/polybag)	14,8272 a	266,4550 b	850,6300 a
P3 (2 g/polybag)	22,4825 a	297,9550 b	1031,8000 a
P4 (2,5 g/polybag)	26,9925 a	225,5150 b	838,0850 a
P5 (3g/polybag)	23,6600 a	215,0225 b	927,8450 a
P6 (3,5 g/polybag)	22,0450 a	82,0700 a	516,5800 a
P7 (4g/polybag)	15,7250 a	56,0800 a	524,0225 a

Description: The average number followed by the same letter in the same column shows no significant difference according to Duncan's test at the 5% level.

Based on the statistical analysis in the table above, at 28 days after planting (DAP), the application of nitrogen fertilizer doses had a significant effect on leaf area parameters. Treatment P3 (2 g/polybag) differed significantly from treatments P6 and P7. At 21 and 35 DAP, the application of nitrogen fertilizer doses did not have a significant effect on leaf area parameters.

Treatment P3 (2 g/polybag) showed a significant effect, presumably related to the increase in the number of leaves, which also contributed to an increase in leaf area. This is consistent with the research by Damayanti & Udayana (2023), which found that an increase in the number of leaves on balsam plants can contribute to an increase in leaf area. This condition is related to the physiological processes of plants, particularly in the mechanism of photosynthesis. As the number of leaves increases, the intensity of photosynthetic activity also tends to increase. A greater number of leaves allows the plant to produce more photosynthates, which ultimately impacts the expansion of leaf area. This indicates that the leaves' ability to capture and absorb sunlight becomes more optimal, resulting in greater energy acquisition and triggering an increase in leaf surface area.

Meanwhile, treatments P6 and P7 showed a significant decrease in leaf area, which is likely consistent with their lower number of leaves. Excessively high doses can cause nutritional imbalance and increase osmotic pressure within cells, which can inhibit leaf tissue expansion. This aligns with (Sarif & Abd. Hadid, 2015), who state that excessive nitrogen application can increase soil acidity and lower pH, negatively impacting plants as other nutrients become bound and

DOI: https://doi.org/10.55173/agriscience.v9i1.175

ISSN : 2597-8713 (ONLINE)
ISSN : 2598-5167 (PRINT)
Agricultural Science
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

difficult to absorb. As a result, the effectiveness and efficiency of fertilization decrease. Not only does this inhibit plant growth, but it also has the potential to cause environmental pollution. Meanwhile, nitrogen deficiency will prevent plants from growing optimally. Therefore, proper nitrogen fertilization management is very important.

Net Assimilation Rate (g/cm/day)

Statistical analysis results show that different doses of nitrogen fertilizer do not have a significant effect on the net assimilation rate at all observation ages. Statistical analysis results are presented in Table 5.

Table 5. Effect of Nitrogen Fertilizer Dose on Net Assimilation Rate Parameters

Treatment	Net Assimilation Rate (g/cm/day)	
	21-28 HST	28-35 HST
P1 (1 g/polybag)	1,277 a	1,061 a
P2 (1,5 g/polybag)	2,009 a	2,223 a
P3 (2 g/polybag)	2,015 a	1,669 a
P4 (2,5 g/polybag)	1,294 a	2,542 a
P5 (3g/polybag)	1,173 a	2,220 a
P6 (3,5 g/polybag)	2,056 a	2,278 a
P7 (4g/polybag)	1,219 a	1,928 a

Description: The average number followed by the same letter in the same column shows no significant difference according to Duncan's test at the 5% level.

Based on the statistical analysis in Table 5, the application of different doses of nitrogen fertilizer did not have a significant effect on the net assimilation rate of balsam plants at either 21–28 days after planting (DAP) or 28–35 DAP. This suggests that during this phase, the plants were unable to efficiently convert nitrogen into structural protein, resulting in photosynthates that did not significantly increase net biomass accumulation. Alternatively, other limiting factors such as water availability, light intensity, or effective leaf area may have influenced photosynthetic efficiency.

Nitrogen plays a crucial role in chlorophyll formation and photosynthetic enzyme production, so its adequate availability can enhance photosynthetic efficiency and the accumulation of net photosynthetic products in plant tissues. This is supported by Nasamsir's (2013) finding that nitrogen presence stimulates leaf growth, increasing the number of stomata per unit leaf area and enhancing solar radiation absorption capacity. Optimal cell division and leaf growth, coupled with the maintenance of leaf osmotic potential, enable efficient absorption of sunlight and carbon dioxide. These conditions support increased photosynthetic activity, which is the primary process

DOI: https://doi.org/10.55173/agriscience.v9i1.175

ISSN : 2597-8713 (ONLINE)
ISSN : 2598-5167 (PRINT)
Agricultural Science
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

in the formation of basic growth compounds in plants. This photosynthetic efficiency is reflected in the increase in Net Assimilation Rate (NAR), which aligns with the increase in Relative Transpiration Rate (RTR).

In the P3 treatment (2 g/polybag), a decrease in the net assimilation rate was observed, likely influenced by increased plant height and leaf area index, resulting in more leaves being in shaded or protected areas. This condition causes an imbalance between photosynthate production and leaf area increase, resulting in a decrease in the net assimilation rate (NAR). This aligns with Tina Andriani's research (2018), which found that the net assimilation rate tends to decrease under shaded conditions and during leaf senescence. This situation reduces photosynthetic activity while respiration continues. As a result, the accumulation of photosynthetic products (assimilates) in the plant decreases.

Leaves with larger surface areas, especially those at the top of the canopy, tend to receive more intense sunlight, resulting in higher CO_2 assimilation rates and the ability to translocate most of their photosynthetic products to other plant organs. Conversely, older leaves in the lower parts, shaded by the leaves above them, receive limited sunlight, resulting in lower CO_2 assimilation activity and contributing only a small portion of photosynthetic products to other parts of the plant (Santana et al., 2021).

Plant Growth Rate (g/day)

Statistical analysis shows that different doses of nitrogen fertilizer have a significant effect on plant growth rate at 21-28 days after planting. The results of the statistical analysis are presented in Table 6.

Table 6. Effect of Nitrogen Fertilizer Dose on Plant Growth Rate Parameters

Treatment	Plant Growth Rate (g/day)	
	21-28 HST	28-35 HST
P1 (1 g/polybag)	0,1039 abc	0,5000 a
P2 (1,5 g/polybag)	0,1811 cd	1,1285 a
P3 (2 g/polybag)	0,1925 d	1,0464 a
P4 (2,5 g/polybag)	0,1250 bcd	1,1464 a
P5 (3g/polybag)	0,1178 abcd	1,0714 a
P6 (3,5 g/polybag)	0,0864 ab	0,5714 a
P7 (4g/polybag)	0,0361 a	0,4143 a

Description: The average number followed by the same letter in the same column shows no significant difference according to Duncan's test at the 5% level.

DOI: https://doi.org/10.55173/agriscience.v9i1.175

ISSN : 2597-8713 (ONLINE)
ISSN : 2598-5167 (PRINT)
Agricultural Science
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

Plant growth rate (PGR) is an important indicator that describes the rate of biomass accumulation or physical growth of plants within a certain period of time. This parameter is greatly influenced by environmental factors, plant physiology, and nutrient availability, particularly nitrogen, which plays a major role in the formation of proteins, enzymes, and chlorophyll, which are important in the process of photosynthesis (Widyaswari et al., 2017).

Based on the statistical analysis of the table above, it is evident that different nitrogen fertilizer doses have a significant effect on growth rate at the observation age of 21–28 HST. The treatment with a dose of 2 g/polybag (P3) is statistically significantly different from treatments P1 and P7. This increase indicates active cell division and elongation, which promotes the formation of new tissues, particularly leaves and stems, which are the primary sites of biomass accumulation in plants. This is supported by Syakir (2015), who states that nitrogen nutrients play a crucial role in the vegetative growth phase, both as providers of assimilates needed for the formation of plant organ structures and in supporting various metabolic processes within the plant.

In treatment P7 (4 g/polybag), there was a decrease in the average plant growth rate. This is likely because nitrogen is only effective in promoting growth up to a certain threshold. Beyond that point, even if the dose is increased, the growth response will not be proportional because plants have physiological limits in absorbing and utilizing nitrogen. Excess nitrogen can lead to inefficient vegetative growth, trigger the formation of fragile tissues, and inhibit the absorption of other nutrients. (Maize, 2024) also noted in their research that excessive nitrogen application can cause enlarged leaves, unbalanced canopy structure, and reduced photosynthesis rates.

Meanwhile, low nitrogen availability can cause a decrease in chlorophyll content and activity, thereby inhibiting photosynthesis rates. As a result, sucrose production for metabolic needs and its distribution to the stem parenchyma tissue decreases (Syakir, 2015). Therefore, nitrogen application at the appropriate dose is necessary as it enhances plant growth, increases plant metabolism, and promotes protein and carbohydrate formation, thereby improving plant growth and production (Indriani et al., 2024).

Chlorophyll Content (mg/g)

Statistical analysis shows that different doses of nitrogen fertilizer do not have a significant effect on chlorophyll content in the leaves of balsam plants at 35 days after planting. The results of the analysis are presented in Table 7.

DOI: https://doi.org/10.55173/agriscience.v9i1.175

ISSN : 2597-8713 (ONLINE)
ISSN : 2598-5167 (PRINT)
Agricultural Science
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

Table 7. Effect of Nitrogen Fertilizer Dose on Chlorophyll Content Parameters

Treatment	ContentChlorophyll (mg/g)
P1 (1 g/polybag)	1,744 a
P2 (1,5 g/polybag)	1,778 a
P3 (2 g/polybag)	1,975 a
P4 (2,5 g/polybag)	1,779 a
P5 (3g/polybag)	1,652 a
P6 (3,5 g/polybag)	1,595 a
P7 (4g/polybag)	1,743 a

Description: The average number followed by the same letter in the same column shows no significant difference according to Duncan's test at the 5% level.

Based on the data obtained, it can be seen that treatment P3 (2 g/polybag) biologically produces higher chlorophyll content than P5 and P6. Although not statistically significant, this shows that moderate doses tend to be more effective in increasing chlorophyll content, while high doses decrease chlorophyll content. Chlorophyll is an essential compound in photosynthesis and is greatly influenced by the presence of nitrogen. Urea, as a nitrogen source, is crucial in stimulating chlorophyll biosynthesis when applied in optimal amounts; however, excessive application can lead to nutritional imbalance or mild metabolic stress, which inhibits chlorophyll formation (Sineshchekov & Belyaeva, 2019).

At 35 days after sowing (DAS), nitrogen fertilizer application did not show a significant effect on chlorophyll content in water hyacinth plants. This is likely due to nitrogen allocation not yet being maximally directed toward the leaves. During the early growth phase, nitrogen absorbed by the plant tends to be allocated first to meristematic tissues such as roots and stems to support the formation of the plant's basic structure. This process results in insufficient nitrogen availability in the leaves for use in the synthesis of photosynthetic proteins such as chlorophyll. Therefore, the chlorophyll response to nitrogen tends to be delayed until the later vegetative phase, when the plant begins to redirect nitrogen allocation toward photosynthetic activities. This statement aligns with the view of Taiz & Zeiger (2010), who state that nitrogen in the early stages of growth is primarily used for meristematic tissue growth rather than for the accumulation of photosynthetic proteins in the leaves. Marschner (2012) also notes that during vegetative growth, most nitrogen is allocated to structural components before the photosynthetic system fully develops. Additionally, chlorophyll content is greatly influenced by environmental conditions such as light intensity, water availability,

DOI: https://doi.org/10.55173/agriscience.v9i1.175

ISSN : 2597-8713 (ONLINE)
ISSN : 2598-5167 (PRINT)
Agricultural Science
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

and temperature. According to Li et al. (2019), chlorophyll depends not only on nitrogen but also on photosynthetic efficiency, which is influenced by environmental factors. If the environment is not optimal, the effects of nitrogen application will not be significant.

Number of Flowers (bud)

Statistical analysis shows that different doses of nitrogen fertilizer have a significant effect on the number of flowers. The results of the statistical analysis are presented in Table 8.

Table 8. Effect of Nitrogen Fertilizer Dosage on Flower Count Parameters

Treatment	Number of flowers (bud)
P1 (1 g/polybag)	58,25 ab
P2 (1,5 g/polybag)	131,00 b
P3 (2 g/polybag)	107,25 ab
P4 (2,5 g/polybag)	106,50 ab
P5 (3 g/polybag)	47,75 a
P6 (3,5 g/polybag)	39,75 a
P7 (4 g/polybag)	36,75 a

Description: The average number followed by the same letter in the same column shows no significant difference according to Duncan's test at the 5% level.

Based on the table above, the results of the study indicate that nitrogen application has a significant effect on the number of balsam flowers. Treatment P2 (1.5 g/polybag) produced the highest number of flowers and was significantly different from treatments P5, P6, and P7. This is likely due to the influence of vegetative growth, such as the number of branches, as stated by Lay et al. (2023), who noted that the number of flower buds on a plant correlates with the number of branches, as flowers grow at the tips of branches.

According to Taiz et al. (2015), during the generative phase, plants actively direct photosynthetic products to reproductive organs such as flowers and fruits. This leads to a progressive increase in flower numbers, especially when plants have formed many new growth points such as branches and lateral buds. Balsam flowers tend to grow in leaf axils and lateral buds. As the plant ages, it produces more branches, which become the sites for flower growth. This aligns with the findings of Liu et al. (2020), who stated that the increase in flower number is highly dependent on the plant's physiological maturity and its ability to effectively form new growth points.

DOI: https://doi.org/10.55173/agriscience.v9i1.175

ISSN : 2597-8713 (ONLINE)
ISSN : 2598-5167 (PRINT)
Agricultural Science
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

During the generative phase, the availability of nitrogen in balanced amounts is crucial for stimulating flower formation. However, if nitrogen is available in excess, the plant tends to exhibit excessive vegetative growth, such as the formation of leaves and stems, thereby inhibiting tissue differentiation toward flower formation. According to Miao et al. (2019), excessive nitrogen fertilization can suppress flowering and instead increase canopy biomass (stems and leaves). In addition to nitrogen, crop cultivation also requires additional nutrients such as phosphorus and potassium to support plant growth and yield (Lay et al., 2023).

Fresh Weight of Flowers (grams)

Statistical analysis shows that different doses of nitrogen fertilizer have a significant effect on the fresh weight of balsam flowers. The results of the statistical analysis are presented in Table 9.

Table 9. Effect of Nitrogen Fertilizer Dose on Fresh Weight Parameters of Flowers

Treatment	Total fresh weight of flowers (gram)
P1 (1 g/polybag)	57,350 a
P2 (1,5 g/polybag)	130,075 b
P3 (2 g/polybag)	90,925 ab
P4 (2,5 g/polybag)	92,850 ab
P5 (3 g/polybag)	41,550 a
P6 (3,5 g/polybag)	37,950 a
P7 (4 g/polybag)	34,550 a

Description: The average number followed by the same letter in the same column shows no significant difference according to Duncan's test at the 5% level.

Based on the statistical analysis in the table above, the application of nitrogen fertilizer in various doses had a significant effect on the fresh weight of the flowers. Treatment P2 (1.5 g/polybag) differs significantly from treatments P1, P5, P6, and P7. This is likely because in treatment P2 (1.5 g/polybag), nitrogen fertilizer application meets the plant's nutrient requirements and stimulates photosynthesis during flower formation. Additionally, flower diameter also plays a role in increasing fresh flower weight, consistent with Luthfiana et al. (2019), who found that fresh flower weight is influenced by flower diameter, where larger flower diameter tends to increase fresh flower weight.

DOI: https://doi.org/10.55173/agriscience.v9i1.175

ISSN : 2597-8713 (ONLINE)
ISSN : 2598-5167 (PRINT)
Agricultural Science
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

According to Taiz et al. (2015), during the generative phase, plants redirect most of the resources from photosynthesis to reproductive organs, particularly flowers and fruits. When the flowers formed in the previous phase have reached physiological maturity, the weight of the flowers produced increases significantly. According to Kumar et al. (2018), flower growth and development are highly dependent on the efficiency of the relationship between source organs and sink organs such as flowers. Active flower organs that become dominant sinks receive higher allocations of photosynthates, thereby significantly supporting the processes of flower formation and enlargement.

In addition to nitrogen, the soil also contains other nutrients such as phosphorus and potassium. Phosphorus (P) plays a role in stimulating root development, especially during the seedling and young plant stages, and accelerates flowering and seed or fruit maturation. Meanwhile, potassium (K) functions in protein and carbohydrate synthesis, strengthens plant structure so that leaves, flowers, and fruits do not easily fall off, and increases plant tolerance to drought and disease attacks (Maulana et al., 2024).

Anthocyanin and Carotenoid Content (mg/g)

Statistical analysis showed that different doses of nitrogen fertilizer had no significant effect on the anthocyanin and carotenoid content in balsam flowers. The results of the statistical analysis are presented in Table 10.

Table 10. Anthocyanin and Carotenoid Content

Treatment	Anthocyanin (mg/g)	Carotenoids (mg/g)
P1 (1 g/polybag)	0,9180 a	0,0817 a
P2 (1,5 g/polybag)	0,6811 a	0,0428 a
P3 (2 g/polybag)	0,5808 a	0,0667 a
P4 (2,5 g/polybag)	0,5194 a	0,0620 a
P5 (3g/polybag)	0,5347 a	0,0583 a
P6 (3,5 g/polybag)	0,4759 a	0,0404 a
P7 (4g/polybag)	0,3721 a	0,0764 a

Description: The average number followed by the same letter in the same column shows no significant difference according to Duncan's test at the 5% level.

Based on the statistical analysis of the table above, the application of nitrogen fertilizer at various doses did not have a significant effect on the anthocyanin content of balsam flowers. Several studies indicate that high nitrogen content can disrupt anthocyanin formation, while

DOI: https://doi.org/10.55173/agriscience.v9i1.175

ISSN : 2597-8713 (ONLINE)
ISSN : 2598-5167 (PRINT)
Agricultural Science
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

increased phosphorus and potassium levels actually promote the production of these pigments (X. Li et al., 2019). This suggests that nitrogen is prioritized for primary metabolites, thereby delaying the production of anthocyanins and carotenoids, which are secondary metabolites.

According to Kong et al. (2008), moderate nitrogen application can support anthocyanin biosynthesis, but high levels can reduce production because plant metabolism is more focused on vegetative growth. This is supported by Marschner (2012), who states that excess nitrogen can cause a dilution effect, i.e., increased biomass without corresponding increases in secondary metabolites like anthocyanins. This lack of significance is likely due to inconsistent physiological responses of plants to treatment, as well as environmental factors such as light, temperature, and humidity that can influence anthocyanin production.

Based on the statistical analysis in the table above, nitrogen fertilizer application at various doses does not significantly affect carotenoid content in water lily flowers. This aligns with the research by Oleszkiewicz et al. (2021), which states that nitrogen fertilization resulted in varying carotenoid content in carrot callus cells depending on the nitrogen dose, although the differences between the overall averages were not significant. In this study, treatment P1 (1 g/polybag) yielded the highest carotenoid content, while higher nitrogen doses tended to reduce carotenoid levels, particularly in treatment P6 (3.5 g/polybag). This decrease is thought to occur because increased nitrogen in plant tissues can increase vegetative metabolism and chlorophyll formation, thereby shifting the synthesis priority away from secondary compounds such as carotenoids.

In the study by Oleszkiewicz et al. (2021), similar results were observed: increasing nitrogen levels from 27 mM to 80 mM did not affect callus growth but significantly reduced carotenoid content. In red spinach plants, excessive nutrient application can inhibit leaf growth and affect carotenoid formation. Carotenoid formation itself is influenced by various environmental conditions such as temperature, water availability, light intensity, and humidity. Carotenoids play an important role in the photosynthesis process, particularly in increasing light absorption, thereby optimizing the energy used in photosynthesis (Manurung & Nurchayati, 2020).

4. CONCLUSION

The application of different nitrogen fertilizer doses has a significant effect on several growth parameters and yields of balsam plants, namely plant height, number of leaves, leaf area, plant growth rate, number of flowers, and fresh flower weight. A nitrogen fertilizer dose of 2.5

DOI: https://doi.org/10.55173/agriscience.v9i1.175

ISSN : 2597 - 8713 (ONLINE)
ISSN : 2598 - 5167 (PRINT)
Agricultural Science
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

g/polybag was the most effective treatment for increasing plant height. A nitrogen fertilizer dose of 1.5 g/polybag had the most favorable effect on flower number and fresh flower weight.

REFERENCE

Adrianingtyas, R. P. (2024). *PENGARUH TINGKAT NAUNGAN DAN APLIKASI KONSENTRASI ECOENZYME TERHADAP PERTUMBUHAN DAN PEMBUNGAAN TANAMAN PACAR AIR (Impatiens walleriana)*. https://repository.ub.ac.id/id/eprint/230048

Alimuddin, A. (2016). *PERBANDINGAN EFISIENSI DYE SENSITIZED SOLAR CELL (DSSC) DARI EKSTRAK DAUN PACAR AIR, BUNGA PACAR AIR MERAH DAN BUNGA PACAR AIR UNGU (Impatiens Balsamina Linn) SEBAGAI DYE SENSITIZER*. https://doi.org/10.24252/jft.v3i0.16829

Ardi Asroh, N. (2019). *PEMANFAATAN KEONG MAS SEBAGAI PUPUK ORGANIK CAIR YANG DIKOMBINASIKAN DENGAN PUPUK NITROGEN DALAM MENDUKUNG PERTUMBUHAN DAN PRODUKSI TANAMAN SELADA (Lactuca sativa L.)*. 83–89. https://doi.org/10.32502/jk.v14i2.2365

Chairiyah, N., Murtilaksono, A., Adiwena, M., & Fratama, R. (2022). *Pengaruh Dosis Pupuk NPK Terhadap Pertumbuhan Vegetatif Tanaman Cabai Rawit (Capsicum frutescens L .) di Tanah Marginal*. *13*(1), 1–8.

Damayanti, P. R., & Udayana, C. (2023). *Pengaruh Berbagai Konsentrasi Eco Enzyme dan Pinching Terhadap Pertumbuhan dan Pembungaan Tanaman Pacar Air (Impatiens hawkeri Bull) Pada Vertical Pipe The Effect of Various Concentrations of Eco Enzyme and Pinching on Growth and Flowering of New Guinea Impatiens (Impatiens hawkeri Bull) in Vertical Pipe*. *11*(1), 1–9. https://doi.org/10.21776/ub.protan.2023.010.01.01

Diyah, W., & Satyana, A. (2021). *Pengaruh Naungan dan Pupuk Urea terhadap Pertumbuhan dan Hasil Tanaman Iler (Plentranthus scutellarioides (L .) R . Br .) Effect of Shade and Urea Fertilizer on the Growth and Yield of Iler Plants (Plectranthus scutellarioides (L .) R . Br .)*. *6*(1), 58–67. https://doi.org/10.21776/ub.jpt.2020.006.1.7

Eko H. A. Juwaningsih, Lena Walunguru, Chatlynbi T. Br Pandjaitan, I. K. S., & Baok, dan J. I. S. (2022). *RESPONS PERTUMBUHAN SAYURAN DAUN TERHADAP VARIASI KONSENTRASI PEMBERIAN POC BIO 3 – PLUS*. 116–123. https://ejurnal.politanikoe.ac.id/index.php/psnp/article/view/135

Hafidha Ade Luthfiana, Gembong Haryono, H. (2019). *HASIL TANAMAN KUBIS BUNGA (Brassica oleracea var. botrytis L.) PADA JARAK TANAM DAN MULSA ORGANIK*. *4*(1), 18–23.

Ichsan Fauzi, S. dan R. T. P. (2021). *PENGARUHDOSIS PUPUKNITROGENPADAPERTUMBUHANDANHASIL TANAMANSAWI(Brassica juncea L.) VARIETAS SAMHONG KING*. 37–43. https://jamp-

ISSN : 2597-8713 (ONLINE)
ISSN : 2598-5167 (PRINT)
Agricultural Science
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

jurnal.unmerpas.ac.id/index.php/jamppertanian

Indriani, K. R., Hadi, R. A., & Sari, F. A. (2024). *Pengaruh Dosis Nitrogen Terhadap Pertumbuhan Dan Hasil Tanaman Pakcoy (Brassica Rapa L .) Varietas Nauli F1*. *2*(2), 42–50. https://doi.org/10.38035/jgpp.v2i2.179

Irwanto, D., Langgeng, R., Wardana, A., Muhammad, F., Luthfi, M., Suyuti, M., Kustiningsih, I., Dhamar, R. S., Kimia, M. T., Sultan, U., Tirtaysa, A., Raya, J., Km, J., Kimia, J. T., Teknik, F., Sultan, U., Tirtayasa, A., Jenderal, J., & Cilegon-indonesia, S. (2021). *JURNAL INTEGRASI PROSES Website : http://jurnal.untirta.ac.id/index.php/jip ANALISIS KANDUNGAN NITRAT , NITRIT , DAN AMONIA DALAM AIR SEBAGAI MEDIUM RELEASE DARI PUPUK UREA PELEPASAN TERKENDALI UNTUK MENGIDENTIFIKASI PENGARUHNYA TERHADAP LINGKUNGAN*. *10*(1), 57–61. https://dx.doi.org/10.36055/jip.v10i1.10066

Kong, J., Chia, L., Goh, N., Chia, T., & Brouillard, R. (2008). *Phytochemistry Corrigendum to ‘‘ Analysis and biological activities of anthocyanins ”*. *69*, 1939–1940.

Kumar, R., Patel, D., & Sharma, S. (2018). Source-sink relationship and its influence on flower development in ornamental plants. *Journal of Horticultural Science and Biotechnology*, *93*(2), 234–241. https://doi.org/10.1080/14620316.2018.1429541 https://doi.org/10.1016/s0031-9422(03)00438-2

Kurniawati, H. Y., & Karyanto, A. (2015). *PENGARUH PEMBERIAN PUPUK ORGANIK CAIR DAN DOSIS PUPUK NPK (15 : 15 : 15) TERHADAP PERTUMBUHAN DAN PRODUKSI TANAMAN MENTIMUN (Cucumis sativus L .)*. *3*(1), 30–35.

Lay, F. R., Wijana, G., Nyoman, N., & Maya, A. (2023). *Pengaruh Media Tanam dan Dosis NPK (16-16-16) terhadap Pertumbuhan dan Hasil Bunga Gumitir (Tagetes erecta L .) The Effect of Plant Media and Dosage of NPK (16-16-16) on Plant Growth and Yield Marigold Flower (Tagetes erecta L .)*. *6*(3), 740–749.

Li, H., Zhang, Y., & Wang, L. (2019). Light, temperature and nutrient availability regulate flower development through photosynthetic efficiency and source-sink balance. *Journal of Plant Physiology*, *236*, 45–53. https://doi.org/10.1016/j.jplph.2019.02.002

Li, X., Zhang, Y., Wang, L., & Chen, J. (2019). Effect of nitrogen, phosphorus, and potassium on anthocyanin biosynthesis in plants: A review. *Journal of Plant Nutrition*, *42*(3), 245–257. https://doi.org/10.1080/01904167.2018.1549673

Made, S., Budiana, A., Kojong, N. S., & Wewengkang, D. S. (2015). *UJI AKTIVITAS ANTIBAKTERI EKSTRAK ETANOL BUNGA DAN BIJI TANAMAN PACAR AIR (Impatiens balsamina L .) TERHADAP PERTUMBUHAN BAKTERI Staphylococcus aureus , Pseudomonas aeruginosa DAN Escherichia coli SECARA IN-VITRO* . *4*(4), 214–223. https://doi.org/10.35799/pha.4.2015.10210

Maize, S. (2024). *Effects of Nitrogen Fertilizer and Planting Density on Growth , Nutrient*

DOI: https://doi.org/10.55173/agriscience.v9i1.175

ISSN : 2597 - 8713 (ONLINE)
ISSN : 2598 - 5167 (PRINT)
Agricultural Science
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

Characteristics , and Chlorophyll Fluorescence in. https://doi.org/10.3390/agronomy14071352

Manurung, F. S., & Nurchayati, Y. (2020). *Pengaruh pupuk daun Gandasil D terhadap pertumbuhan , kandungan klorofil dan karotenoid tanaman bayam merah (Alternanthera amoena Voss .) The effect of Gandasil D foliar fertilizer on growth , chlorophylls , and carotenoid content of the red spinach (Alternanthera amoena Voss .)*. *3*(1), 24–32. https://doi.org/10.14710/jbt.1.1.24-32

Marschner, P. (2012). *Marschner's Mineral Nutrition of Higher Plants* (3rd ed.). Academic Press. http://dx.doi.org/10.1016/C2009-0-63043-9

Masluki. (2015). *RESPON BERBAGAI DOSIS PUPUK NITROGEN TERHADAP PERTUMBUHAN BIBIT TANAMAN KAKAO*. *3*(3). https://journal.uncp.ac.id/

Maulana, M. R., Ria, E. R., & Widodo, R. W. (2024). *Pengaruh Konsentrasi Pupuk Daun dan Dosis NPK terhadap Pertumbuhan dan Produktivitas Bunga Pepaya Jantan (Carica Papaya L .)*. *2*(1), 28–35.

Miarti & Legasari, A. L. (2022). *KETIDAKPASTIAN PENGUKURAN ANALISA KADAR BIURET, KADAR NITROGEN, DAN KADAR OIL PADA PUPUK UREA DI LABORATORIUM KONTROL PRODUKSI PT PUPUK SRIWIDJAJA PALEMBANG*. *2*(3), 861–874. https://doi.org/10.53625/jcijurnalcakrawalailmiah.v2i3.4023

Nasamsir. (2013). *EFEK PEMBERIAN KOMBINASI GARAM DAPUR DAN PUPUK NITROGEN TERHADAP PERTUMBUHAN BIBIT KARET (Hevea brasilliensis Muell.Arg.) DI POLIBAG*. *13*(4), 74–80. https://doi.org/10.33087/jiubj.v13i4.325

Nugroho, W. S. (2015). *Penetapan Standar Warna Daun Sebagai Upaya Identifikasi Status Hara (N) Tanaman Jagung (Zea mays L .) pada Tanah Regosol*. *3*(1), 8–15. https://doi.org/10.18196/pt.2015.034.8-15

Oleszkiewicz, T., Kruczek, M., & Baranski, R. (2021). *Repression of Carotenoid Accumulation by Nitrogen and NH 4 + Supply in Carrot Callus Cells In Vitro*. https://doi.org/10.3390/plants10091813

Priambodo, O. N. (2021). *Model Simulasi Nitrogen Pada Tanaman Tebu (Saccharum officinarum L .)*. *3*(2), 1–8. https://doi.org/10.36870/jvti.v3i2.236

Rahmawati, A., Ayu, D., Hartanti, S., & Agribisnis, P. (2021). *ANALISIS KELAYAKAN USAHATANI TANAMAN PACAR AIR (Impatiens balsamina) DI DESA DUKUH KLOPO KECAMATAN*. *3*(2), 193–201. https://doi.org/10.32764/agrosaintifika.v3i2.1578

Santana, F. P., Ghulamahdi, M., & Lubis, I. (2021). *Respons Pertumbuhan , Fisiologi , dan Produksi Kedelai terhadap Pemberian Pupuk Nitrogen dengan Dosis dan Waktu yang Berbeda (Growth , Physiological , and Soybean Production Responses to Different Dosages and Times of Nitrogen Fertilizer)*. *26*(1), 24–31. https://doi.org/10.18343/jipi.26.1.24

DOI: https://doi.org/10.55173/agriscience.v9i1.175

ISSN : 2597-8713 (ONLINE)
ISSN : 2598-5167 (PRINT)
Agricultural Science
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

Sarif, P., & Abd. Hadid, I. W. (2015). *PERTUMBUHAN DAN HASIL TANAMAN SAWI (Brassica juncea L.) AKIBAT PEMBERIAN BERBAGAI DOSIS PUPUK UREA*. *3*(5), 585–591.

Sigit, S., & Pamungkas, T. (2018). *Pemanfaatan Bawang Merah (Allium cepa L .) Sebagai Zat Pengatur Tumbuh Alami terhadap Pertumbuhan Bud Chip Tebu pada Berbagai Tingkat Waktu Rendaman Utilization of Shallots (Allium cepa L .) as a Natural Growth Regulator for the Growth of Sugarcane Bud Chip at Various Levels of Soaking Time*. *14*(2). http://dx.doi.org/10.31941/biofarm.v14i2.791

Sineshchekov, V. A., & Belyaeva, O. B. (2019). Regulation of Chlorophyll Biogenesis by Phytochrome A. *Biochemistry (Moscow)*, *84*(5), 491–508. https://doi.org/10.1134/S0006297919050043

Sutari, W. (2016). *Pengaruh konsentrasi pupuk organik cair (POC) dan dosis pupuk N , P , K terhadap pertumbuhan dan hasil tanaman jagung manis (Zea mays L . var Rugosa Bonaf) kultivar Talenta The effect of organic liquid fertilizer concentration and N , P , K fertilizer dosage on growth and yield of sweet corn (Zea mays L . var . Rugosa bonaf) cultivar Talenta*. *15*(3), 208–216. https://doi.org/10.24198/kultivasi.v15i3.11764

Syakir, M. (2015). *PERAN DAN PENGELOLAAN HARA NITROGEN PADA TANAMAN TEBU UNTUK PENINGKATAN PRODUKTIVITAS TEBU Role and Management of Sugarcane Nitrogen Nutrient to Increase Productivity*. *14*(2), 73–86. https://doi.org/10.21082/p.v14n2.2015.73-86

Syamsul, A., Kesehatan, F. I., Islam, U., & Alauddin, N. (2012). *No Title*. https://doi.org/10.24252/as.v10i2.6903

Taiz, L., & Zeiger, E. (2010). *Plant Physiology* (5th ed.). Sinauer Associates. https://doi.org/10.1093/aob/mcg079

Taiz, L., Zeiger, E., Møller, I. M., & Murphy, A. (2015). *Plant Physiology and Development* (6th ed.). Sinauer Associates. http://dx.doi.org/10.1093/hesc/9780197614204.001.0001

Tando, E. (2018). *Review : Upaya Efisiensi Dan Peningkatan Ketersediaan Nitrogen Dalam Tanah Serta Serapan Nitrogen Pada Tanaman Padi Sawah (Oryza sativa L .)*. 171–180. http://dx.doi.org/10.33366/bs.v18i2.1190

Tina Andriani, R. T. P. dan S. H. P. (2018). *PENGARUH KOMBINASI UREA DAN PUPUK ORGANIK CAIR TERHADAP PERTUMBUHAN DAN HASIL SAWI HIJAU (Brassica juncea L.)*. 8–15. https://jamp-jurnal.unmerpas.ac.id/index.php/jamppertanian

Widyaswari, E., Santosa, M., Produksi, J. M., Pertanian, F., Brawijaya, U., Junrejo, K., & Tumbuh, A. (2017). *Analisis Pertumbuhan Dua Varietas Tanaman Padi (Oryza sativa L .) pada Berbagai Perlakuan Pemupukan*. *5*(3), 73–77. http://dx.doi.org/10.21776/ub.biotropika.2017.005.03.2

DOI: https://doi.org/10.55173/agriscience.v9i1.175