

THE EFFECT OF NITROGEN FERTILIZER DOSAGE ON DISEASE SEVERITY FOR GROWTH AND PRODUCTION OF RICE PLANTS



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ABSTRACT

Nitrogen fertilizer is important in increasing rice yields, but the proper dosage must be considered to maximize the results and reduce the risk of disease attacks. The study aimed to assess how various nitrogen fertilizer dosages affected disease severity, plant growth, and rice production. This research was conducted in the Village of Ibo Jaya, Region of Konda, South Konawe Regency, applying a block design that is randomized (RAK). The experiment included six treatments and three replications, namely without fertilization (P0), 50 kg/ha⁻¹ Urea, 300 kg/ha⁻¹ Phonska (essential fertilizer), 100 kg/ha⁻¹ Urea, 150 kg/ha⁻¹ Urea, and 200 kg/ha⁻¹ Urea. The variables observed included the severity of blast disease (*Pyricularia oryzae*) and bacterial blight (*Xanthomonas oryzae* pv. *oryzae*), plant height, number of leaves, number of tillers, panicle length, number of grains per panicle, weight of grain per panicle, percentage of filled grain per panicle, weight of grain per clump, weight of 1000 grains, and rice production. The study's findings showed that the dose of nitrogen fertilizer, Both 150 and 200 kg of urea/ha, had a positive effect on growth and production, increasing plant height, number of leaves, number of tillers, the weight of 1000 grains (36.00 g), and grain production (4.83 tons/Ha). In addition, the 100 kg /ha⁻¹ Urea doses and 150 kg /ha⁻¹ Urea tended to reduce the severity of bacterial leaf blight and blast diseases. Therefore, applying the 200 kg/ha⁻¹ increased rice yields, while a 100 kg/ha⁻¹ dosage could reduce the disease risk.

Keywords: bacterial leaf blight; blast; ciliwung variety; urea.

INTRODUCTION

Rice (*Oryza sativa* L.) is among the primary food commodities in Indonesia and is a staple food in many Asian countries. Based on the Central Statistics Agency (BPS) report, rice production in Indonesia in 2020 reached 54.65 million tons. This figure decreased in 2021 to 54.42 million tons, a decrease of 233.91 thousand tons. However, production increased again in 2022 to 54.75 million tons, an increase of 333.68 thousand tons compared to the previous year (Ramadhani & Jalil, 2023). Although production has increased, the sustainability of rice productivity faces various challenges, incredibly ineffective fertilization practices and the threat of diseases that can reduce yields

One of the tactical measures to boost rice productivity and production is fertilization. Fertilization is important in providing nutrients that plants need to grow optimally. Nutrients are divided into macro and microelements. Large amounts of elements like nitrogen (N), phosphorus (P), potassium (K), magnesium (Mg), calcium (Ca), and sulfur (S)) are known as macronutrients (Islam et al., 2022).

The most vital nutrient is nitrogen (N) element because the plant's nitrogen needs are higher than other elements. Lack of nitrogen can cause suboptimal plant growth, while excess nitrogen can interfere with growth and pollute the environment (Mondal et al., 2023). Therefore, proper nitrogen dosing is necessary to support rice plants' optimal and sustainable development.

While nitrogen plays a significant role in rice growth, overuse of nitrogen fertilizer can also increase plant susceptibility to disease. *Xanthomonas oryzae* pv. *Oryza* is the source of bacterial leaf blight (BLB) in rice, one of the biggest threats to rice production worldwide. Losses due to BLB are



significant, both quantitatively and qualitatively. Globally, yield losses due to BLB are thought to reach 50% under severe infection conditions (Shekhar et al., 2020). In addition, blast illness brought on by *Pyricularia oryzae* is also very costly, with yield losses reported to be as high as 100% under severe infestation conditions (Barnwal et al., 2013; Mau et al., 2020). These two diseases significantly threaten rice productivity, especially in high nitrogen fertilization intensity fields.

Too much nitrogen use has been demonstrated to raise the intensity of disease attacks, such as bacterial leaf blight (Supriyanto, E.A., S. Jazilah, 2010). However, few studies have comprehensively explored the optimal nitrogen dosage to increase rice productivity without increasing the risk of disease infection. Therefore, this study thoroughly examines the ideal nitrogen dosage, which supports rice growth and yield and minimizes the risk of disease intensity.

This study offers a novel fertilizer management approach by evaluating a more balanced nitrogen fertilization strategy. Therefore, this study aims to assess nitrogen's effects on fertilizer dosage on rice plants' growth, yield, and quality.

MATERIALS AND METHODS

The Studies were carried out in the paddy fields of Village Lebo Jaya Southeast Sulawesi, located in the Konda Subdistrict of the South Konawe District, from May to September 2024.

Land Processing and Planting

Land cultivation in this study started with plowing the soil using a tractor. After that, the soil was irrigated until saturated to prepare it for planting. The main focus in tillage was bed improvement, which was done by plowing and leveling the soil. Experiment plots were created with a size of 2 m × 4 m per plot, and the distance between plants was 25 cm × 25 cm. Meanwhile, the experimental plots were separated by 50 cm to facilitate observation and maintenance. The total area of land used for this study was 6 × 24 m², which included several experimental plots to test different treatments on the land.

In this study, rice seeds were sown first in open fields. After the plants were 14 days old, The seeds were moved to the field for planting using a 2:1 jajar legowo planting system. The purpose of using this system was to reduce the attack of rats and snails and to facilitate the process of plant maintenance. Planting was done manually with two plants in one planting hole. The separation between the plants was 25 cm × 25 cm, while the distance between plots was 50 cm. The total area of land used for this study was 12 m × 24 m², providing enough space for the experiment with these spacing arrangements.

Fertilization

The fertilization of rice plants was carried out using phonska base fertilizer at a dosage of 300 kg/Ha, comparable to 120 g, and given two weeks after planting (MST) and 6 MST. Based on the research design, nitrogen fertilizer was added using urea fertilizer with a predetermined dose. Fertilization was carried out three times, at the age of 2, 3, and 4 weeks after planting, with different doses at each application. The third fertilizer application was made in the vegetative to the generative phase when the flag leaf came out, or rice entered the bunting phase.

Maintenance

Rice plant maintenance measures include two main things, namely, weeding and pest control. Weeding is done every two weeks to clean weeds that can inhibit the growth of rice plants by pulling grass or weeds in each treatment plot. Weeding aims to reduce nutrient competition between weeds and rice plants. Meanwhile, pest control in rice plants is done manually by catching insects that attack plants directly to reduce the damage caused by pests.

Research Design

This research design uses a simple randomized group design (RAK) method with one factor. Six treatments were tested, each repeated three times, so the total experimental units amounted to 18. The following are the treatments used in the study is P0 = No Fertilization (control), P1 = 300 kg/ha⁻¹ Phonska (120 grams/plot) as base fertilizer, P2 = 50 kg/ha⁻¹ Urea with details of 12 grams/plot (30%), 16 grams/plot (40%), 12 grams/plot (30%), P3 = 100 kg/ha⁻¹ Urea with details of 24 grams/plot (30%), 32 grams/plot (40%), 24 grams/plot (30%), P4 = 150 kg/ha⁻¹ Urea with details of 36 grams/plot (30%), 48 grams/plot (40%), 36 grams/plot (30%), P5 = 200 kg/ha⁻¹ Urea with details of 48 grams/plot (30%), 64 grams/plot (40%), 48 grams/plot (30%)

Observation Variable

1. Leaf Blight and Blast Caused by Bacteria Disease in Rice Plants

In this study, the variable observed was disease severity in rice plants, specifically for bacterial leaf blight (BLB) and blast. Observations were made visually by observing the symptoms of rice plants and categorizing them into specific categories based on severity.

Disease severity was calculated per plant clump using the equation suggested by Townsend, G. R., and Heuberger (1943):

$$KP = \frac{\sum(n_i \times v_i)}{Z \times N} \times 100\% \quad (1)$$

Description: KP = The degree of the disease (%), n = Average quantity of leaves infested in a particular category, v = A scale value representing the severity of each disease attack category, N = The total quantity of leaves observed in the sample, Z = most significant value in the category used to measure the severity of disease attack.

The disease severity score used follows the guidelines (Masnilah et al., 2002), as follows: score 1 (severity 1-6%), score 3 (severity 6-12%), score 5 (severity 12-25%), score 7 (severity 25-50%), and score 9 (severity 50-100%)

2. Plant Height and Leaf Count

Plant height observations were made at 2 weeks after planting. A ruler was used to measure the height of rice plants from the root collar (the area where the root and stem meet) to the topmost leaf's tip on the rice plant. The measurement results were expressed in centimeters (cm). The number of leaves is observed by calculating the quantity of wholly opened primary stem leaves in the rice plant. This observation is done every 2 weeks to monitor the development of The quantity of leaves over time.

3. Number of tillers and panicle length

Observation of the quantity of rice plant tillers is done every 1 week. This observation is done by counting the number of tillers grown and new shoots grown on the stems of rice plants. Observations of panicle length were made by measuring the length of one panicle from the most extended base to its tip panicle. This measurement was done after harvest using a ruler to ensure the accuracy of panicle length measurement.

4. Total Grain Per Panicle (grains) and Grain Weight Per Panicle

The total number of grains in a single panicle is calculated as the total grain per panicle. This observation is done by counting all the grains in one panicle. This parameter is often measured to determine the grain yield of each panicle and is used as an indicator of rice plant productivity. Meanwhile, grain weight per panicle is the grain yield measured in units of weight (grams) per panicle, which is done after harvest.

5. 1000 Grain Weight and Rice Production

1000-grain weight (gram) is the weight of 1000 grains measured by weighing in each experimental treatment. This measurement is used to evaluate grain size and seed quality. This weight may vary depending on the variety of rice and the growing conditions. Meanwhile, rice productivity (tons/ha^{-1}) was determined using a 2 m x 2 m ubinan. The grain yields obtained from the tinned area are then converted into tons per hectare by calculating the dry grain per clump and multiplying it by a conversion factor. One of the conversion formulas used to calculate dry grain yield per hectare is:

$$\text{Production} = \frac{10.000 \text{ m}^2}{\text{Luas Plot (m}^2)} \times \frac{x \text{ (kg)}}{1000 \text{ (kg)}} \quad (2)$$

Description: Y: Total production yield measured in one ton per hectare (ton/ha^{-1}), X: Total yield obtained from one plot, expressed in kilograms (kg), L: Land area of each plot calculated in square meters (m^2)

Data Analysis

The data obtained from the observations were then subjected to statistical analysis in the form of the F test (ANOVA) at the 95% confidence level; if the distinction existed, then it could be carried on to the process of honest real difference test (BNJ).

RESULTS AND DISCUSSION

Disease Severity in Rice Plants

The impact of various doses of Nitrogen fertilizer on the severity of bacterial leaf blight and blast is shown in Table 1 and Table 2.

Table 1. Impact of nitrogen fertilizer application in various dosage levels of the severity of bacterial leaf blight attack on rice plants aged 14, 21, and 28 days after transplanting (HST).

Fertilizer Dosage	Disease Severity (%)		
	14 HST	21 HST	28 HST
0 kg/ha ⁻¹ Urea	^a 1,22	^a 2,11	^a 2,89
300 kg/ha ⁻¹ Phonska	^b 0,89	^a 2,00	^a 2,33
50 kg/ha ⁻¹ Urea	^b 0,89	^b 1,78	^c 1,89
100 kg/ha ⁻¹ Urea	^b 0,78	^b 1,56	^c 1,78
150 kg/ha ⁻¹ Urea	^b 0,78	^c 1,44	^c 1,67
200 kg/ha ⁻¹ Urea	^b 0,89	^b 1,67	^b 2,00

Table 2. The impact of nitrogen fertilizer administration at various dosage levels on the severity of blast disease attacks at the vegetative stage at 14, 21, and 28 days after planting (DAP).

Fertilizer Dosage	Disease Severity (%)		
	14 HST	21 HST	3 HST
0 kg/ha ⁻¹ Urea	^a 1,78	^a 2,33	^a 2,67
300 kg/ha ⁻¹ Phonska	^b 1,22	^a 2,00	^a 2,33
50 kg/ha ⁻¹ Urea	^b 1,22	^b 1,89	^a 2,00
100 kg/ha ⁻¹ Urea	^c 0,89	^b 1,78	^b 1,89
150 kg/ha ⁻¹ Urea	^c 1,00	^b 1,67	^b 1,78
200 kg/ha ⁻¹ Urea	^b 1,22	^a 1,89	^a 2,00

Nitrogen fertilization affected the severity of rice plant bacterial leaf blight, according to the variance analysis shown in Table 1. At 14 HST, the disease was first noticed. With almost the same disease severity of 0.78%, treatments P3 and P4 had the lowest infection rate, while the treatment without nitrogen fertilizer (P0) had the highest infection rate. However, treatments P1, P2, and P5 were not significantly different. According to (Yuliani et al., 2015)(Yuliani et al., 2015), this is thought to be because the first planting conditions occurred during the rainy season, making young plants more vulnerable to rainwater splashes that can transfer *Xoo* bacterial inoculum to plants through wounds or hydathodes.

Further, excessive nitrogen fertilization can cause plant cell walls to thin, making leaves more succulent and more susceptible to disease attack (Yumardian Saleh, 2023). This condition facilitates the entry of pathogens and causes further disease development. The infection continues to increase until the age of the plant reaches 28 HST, where bacterial leaf blight attacks more old leaves, as described by (Semangun, 1991; Susanto, 2011). Old leaves that contain chlorophyll have more protein, which helps metabolize bacteria and accelerate infection in plants at various stages of growth, from seedling to near harvest (Yuriyah et al., 2018).

In addition, excessive and disproportionate use of nitrogen fertilizers can weaken plant tissues, such as stems and leaves. This increases the risk of pest and disease attacks. Increased doses of nitrogen in fertilization also correlate with disease severity, including bacterial leaf blight. This suggests that over-fertilizing nitrogen can harm plant health and reduce yields (Supriyanto, E.A., S. Jazilah, 2010).

According to Zuraidah (2011), the development of this disease is highly dependent on environmental factors and plant age. The most significant increase in infection, 5.96%, occurred at 5 weeks of age. This was caused by an average temperature of 25.37°C and a micro-humidity of 90.45%. These humid environmental conditions favor the proliferation of *Xoo* bacteria, as stated by (Yuriyah et al., 2018), which states that temperatures between 25-30°C with humidity above 90% are ideal for bacterial development.

The findings indicated that using nitrogen fertilizer affected the severity of leaf blast disease, as shown in Table 2. The highest infection occurred in treatments P0, P1, and P5, with the highest urea dose of 200 kg/ha⁻¹. Increasing the dosage of nitrogen fertilizer is thought to increase the occurrence of infection in blast disease. Leiwakabessy et al. (2020) also reported an increase in blast disease attacks in line with the increase in nitrogen doses. In addition, humid weather, especially during the rainy season, favors infection (Puslitbangtan, 2005). Nitrogen fertilizer increases water permeability in epidermal cells and decreases silicate content, facilitating fungal penetration. According to research by Yuliani et al. (2015), The degree of blast disease is positively related to the amount of nitrogen fertilizer used.

Plant Height and Leaf Count

The effects of different Nitrogen fertilizer doses on plant height growth and number of leaves can be found in Table 3 and Table 4.

Table 3. Effects of application of various dosage nitrogen fertilizer amounts on rice growth plant height (cm) at 14, 21, and 28 HST.

Fertilizer Dosage	14 HST	21 HST	28 MST
0 kg/ha ⁻¹ Urea	^c 17,33	^c 32,11	^d 40,56
300 kg/ha ⁻¹ Phonska	^c 19,67	^b 37,89	^c 54,11
50 kg/ha ⁻¹ Urea	^{ab} 20,67	^b 38,78	^b 55,44
100 kg/ha ⁻¹ Urea	^c 19,89	^b 39,22	^b 55,89
150 kg/ha ⁻¹ Urea	^{ab} 20,89	^{ab} 39,44	^b 57,11
200 kg/ha ⁻¹ Urea	^a 22,67	^a 43,89	^a 62,56

Table 4. Impact of application of different levels of nitrogen fertilizer on the number of leaves of rice plants at 14, 21, and 28 days after transplanting (HST).

Fertilizer Dosage	14 HST	21 HST	28 HST
0 kg/ha ⁻¹ Urea	^c 17,56	^c 30,78	^c 42,44
300 kg/ha ⁻¹ Phonska	^b 20,67	^b 34,78	^b 47,44
50 kg/ha ⁻¹ Urea	^b 20,89	^b 35,11	^{ab} 51,00
100 kg/ha ⁻¹ Urea	^b 20,78	^b 34,00	^{ab} 51,22
150 kg/ha ⁻¹ Urea	^b 21,89	^{ab} 36,00	^{ab} 51,33
200 kg/ha ⁻¹ Urea	^a 24,33	^a 39,00	^a 55,11

Table 3 and Table 4 show that different nitrogen fertilizer doses significantly affected the quantity of rice plant height and leaves (cm). According to the variance analysis, both variables were significantly affected by the nitrogen dose treatments. Based on the mean value test results, plant growth increased consistently with increasing nitrogen dosage (Tables 3 and Table 4). Increasing the plant's height and quantity of leaves indicates optimal rice growth, which correlates with larger doses of Urea. The best increase in the plant's height and quantity of leaves was achieved with 200 kg/ha nitrogen application.

This fact aligns with the findings reported by Anwar et al. (2016), which state that applying urea fertilizer as big as 200 kg/ha-1 increases rice yields, plant height growth, and the number of productive tillers. This increase can be explained by the fulfillment of nitrogen requirements that support plant metabolic activities. Nitrogen plays a significant part in increasing the growth of rice plants, including improving root growth, height, quantity of panicles, number of tillers, and rice yield. Kamiji et al. (2011) stated that nitrogen is an essential element that supports the process. This is also supported by research by Zadeh, A. N. (2014), which showed that an increase in nitrogen dose was significantly correlated with an increase in plant height.

The element nitrogen is an essential component that supports various development of plant processes in plants. According to Sarief (1985), increasing nitrogen levels accelerates the synthesis of carbohydrates, which are converted into proteins and protoplasm and are crucial to support vegetative growth. This is in line with the view of Sirajuddin (2010) that nitrogen plays a significant role in stimulating the growth of roots, stems, and leaves and increasing plant height.

In addition, Made (2010) adds that the availability of nitrogen in sufficient quantities creates a balanced ratio between leaves and roots so that the vegetative growth process can occur usually and flawlessly. Nitrogen is also a key element in the formation of chlorophyll, which affects the efficiency of photosynthetic activity in the leaves, thus supporting overall plant growth.

Number of Tillers

The impact of the amount of nitrogen fertilizer on the number of tillers is shown in Table 5.

Table 5. Impact of applying different dosage levels of nitrogen fertilizer on the number of tillers per clump in rice plants aged 14, 21, and 28 days after transplanting (HST).

Fertilizer Dosage	14 HST	21 HST	28 HST
0 kg/ha ⁻¹ Urea	^d 7,78	^d 10,33	^c 15,11
300 kg/ha ⁻¹ Phonska	^c 10,78	^c 14,78	^b 20,11
50 kg/ha ⁻¹ Urea	^b 11,56	^b 15,22	^b 20,22
100 kg/ha ⁻¹ Urea	^b 12,67	^b 16,00	^b 20,67
150 kg/ha ⁻¹ Urea	^{ab} 13,00	^{ab} 16,89	^b 20,67
200 kg/ha ⁻¹ Urea	^a 14,56	^a 18,56	^a 24,00

Table 5 shows that different amounts of fertilizer significantly influence The quantity of rice tillers. Using a dose of 200 kg/ha⁻¹ generated the most significant quantity of tillers, with an average of 24.00 tillers, while the control without fertilizer only produced 15.11 tillers (P0). This confirms the results of Chairunnisak et al. (2018), which state that nitrogen, especially Urea, is essential in forming tillers in rice plants.

Further analysis showed that the 200 kg/ha⁻¹ dose differed notably from the control, while the other treatments showed no significant differences. Adequate nitrogen application ensures that the plant's nutritional needs are met, which has a favorable impact on vegetative growth and The quantity of tillers. Other research by Yurnavira (2015) and Yetti, H. (2010) also supports this statement, stating that optimal nutrient conditions and plant genetic factors significantly affect the number of tillers. In addition, Purbajanti (2013) and Soepardi (1983) stated that increased nutrition, especially nitrogen, can improve root growth and nutrient absorption, supporting rice plants' vegetative development.

Panicle Length, Total Grain Per Panicle and Number of Grain Per Panicle

The effect of Nitrogen doses on panicle length, number of grains per panicle, and grain weight per panicle can be seen in Table 6 and Table 7.

Table 6. Impact of various dosage levels of nitrogen fertilizer on panicle length, number of grains per panicle (Grain), and weight of grains per panicle (gram) in rice plants.

Fertilizer Dosage	Panicle Length (cm)	Number of Grain Per Panicle (Grain)	Grain Weight Per Panicle (gram)
0 kg/ha ⁻¹ Urea	^c 19,67	^b 98,66	^c 2,81
300 kg/ha ⁻¹ Phonska	^{bc} 22,78	^b 108,00	^b 3,50
50 kg/ha ⁻¹ Urea	^b 23,22	^b 108,78	^b 3,92
100 kg/ha ⁻¹ Urea	^b 23,78	^b 117,22	^b 4,59
150 kg/ha ⁻¹ Urea	^a 25,78	^a 116,56	^b 6,02
200 kg/ha ⁻¹ Urea	^a 28,67	^a 119,33	^a 6,37

Table 7. Impact of various dosage levels of nitrogen fertilizer on grain weight per clump (gram) and percentage of filled grain per panicle (%) in rice plants.

Fertilizer Dosage	Number of Grain Per Clump (gram)	Percentage of filled grains per panicle (%)
0 kg/ha ⁻¹ Urea	^e 18,73	^b 73,73
300 kg/ha ⁻¹ Phonska	^d 40,87	^b 77,52
50 kg/ha ⁻¹ Urea	^c 52,66	^{ab} 80,20
100 kg/ha ⁻¹ Urea	^c 61,96	^b 78,88
150 kg/ha ⁻¹ Urea	^b 93,00	^a 81,56
200 kg/ha ⁻¹ Urea	^a 102,46	^a 84,57

The results of the BNJ test show that variations in the amount of nitrogen fertilizer had a very significant effect on rice plants, the panicle length, the number of grains per panicle, and grain weight per panicle. The treatment with a dosage of Urea 200 kg/ha⁻¹ significantly increased the length of panicles to 28.67 cm and the grain weight per panicle to 6.37g. These results follow the findings (Irawati et al., 2017), Which assert that plant varieties influence panicle length and are directly proportional to grain weight per panicle.

The results of the BNJ test show that the dose of Urea 200 kg/ha⁻¹ (P5) produced the maximum quantity of grains in each panicle, 119.33 grains, which was significantly different from the control, which only produced 98.66 grains. Pradipta et al. (2017) mentioned that the dosage of 200 kg/ha⁻¹ is the optimal dose to increase the panicle length and the number of grains inside because it increases the nitrogen content that supports the growth of panicle length.

Many factors, including panicle length and nutrient availability, influence the capacity of rice crops to produce grain. Variations in panicle length affect the number of ovules formed; The panicle's length increases the potential quantity of ovules that can develop (Mahmud & Purnomo, 2014).

1000 Grain Weight and Rice Production

The impact of nitrogen fertilizer dosage on 1000-grain weight and rice yield can be seen in Table 8.

Table 8. Impact of different dosage levels of nitrogen fertilizer on 1000-grain weight (gram) and yield (ton ha⁻¹) in rice.

Fertilizer Dosage	1000 Grain Weight (gram)	Rice Production (tons ha ⁻¹)
0 kg/ha ⁻¹ Urea	^c 15,22	^c 2,75
300 kg/ha ⁻¹ Phonska	^c 22,22	^{bc} 3,58
50 kg/ha ⁻¹ Urea	^{bc} 25,56	^b 3,83
100 kg/ha ⁻¹ Urea	^b 26,89	^b 4,08
150 kg/ha ⁻¹ Urea	^{ab} 30,44	^a 4,50
200 kg/ha ⁻¹ Urea	^a 36,00	^a 4,83

The BNJ test results showed that different doses of nitrogen fertilizer had a notable impact on the 1000-grain weight and rice production (ton/ha⁻¹). Treatment with a dose of 200 kg/Ha of Urea raised the mass of 1000 grains to 36.00 g, which is considered ideal for optimal growth of rice plants. Genetic factors influence the grain produced because each rice variety has different characteristics.

Research by Samudin et al. (2022) showed that the weight of 1000 rice grains has a high level of heritability, which means genetic factors are more influential than the environment. Research shows that the availability of adequate nutrients is also important to support the growth of rice plants. Kanfany et al. (2014) demonstrated that the increase in grain yield was directly proportional to the fertilization dose. Urea treatment significantly increased the weight of 1000 grains compared to the control (Soplanit & Nukuhaly, 2018).

Rice production with a dose of Urea 200 kg/ha⁻¹ (P5) reached 4.83 tons/ha⁻¹, higher than the control (2.75 tons/ha⁻¹). Samudin et al. (2024) mentioned that nitrogen fertilizer 200 kg/Ha could significantly increase rice growth and production, supported by parameters such as the number of productive tillers and panicle length. According to Nazirah et al. (2015), genetic factors also play an important role in the high production of rice.

CONCLUSIONS

Based on the research, the use of nitrogen fertilizers at doses of 150 kg/ha⁻¹ and 200 kg/ha⁻¹ Urea showed An important impact on the growth and rice yield production, including height of the plant, quantity of leaves, and quantity of productive tillers, 1000 seed weight (36.00 g), and grain yield (4.83 tons/ha⁻¹). The 200 kg/ha⁻¹ Urea fertilizer rate was the most effective in increasing rice yield. On the other hand, applying nitrogen fertilizer doses of 100 kg/ha⁻¹ and 150 kg/ha⁻¹ can reduce the severity of bacterial leaf blight and blast, providing more protection against disease infection at these doses. Therefore, Applying 200 kg/ha⁻¹ of nitrogen fertilizer per hectare can potentially increase rice yield and growth, while the 100 kg/ha⁻¹ dose is more effective in reducing disease attacks.

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