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Effectiveness of NPK 18-18-18 Fertilizer Application on Vegetative Growth and Yield Performance of Sweet Corn

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Abstract. Sweet corn is a horticultural commodity that is widely consumed in Indonesia. This study evaluated the effectiveness of NPK 18-18-18 fertilizer on the vegetative growth, yield components, and relative agronomic effectiveness (RAE) of sweet corn (*Zea mays saccharata*). Field experiments were conducted using fertilizer dosages of 0,50, 0,75, 1,00, and 1,50 NPK, with a control treatment for comparison. The application of NPK 18-18-18 significantly increased plant height, stem diameter, leaf number, ear length, ear diameter, biomass weight, ear weight with husk, ear weight without husk, plot yield, and overall productivity compared with the control. Mean values across treatments ranged from 68,94–205,72 cm for plant height, 7,41–20,47 mm for stem diameter, 6,01–13,00 leaves per plant, 15,41–20,89 cm for ear length, and 36,05–49,65 mm for ear diameter. Biomass weight ranged from 0,12–0,34 kg, ear weight with husk from 0,13–0,34 kg, and ear weight without husk from 0,12–0,28 kg. Plot yield varied between 7,91–25,46 kg, corresponding to productivity levels of 5,02–16,16 t/ha. RAE analysis indicated that fertilizer application was effective at dosages of 0,75, 1,00, and 1,50 NPK, with the highest effectiveness observed at 1,50 NPK (118%). Notably, the 0,75 NPK dosage achieved an RAE value of 101%, demonstrating that lower fertilizer input can enhance yield while reducing production costs and mitigating fertilizer scarcity. These findings suggest that NPK 18-18-18 fertilizer, when applied at an optimal dosage, can be effectively utilized in sweet corn cultivation to improve growth and productivity while ensuring efficient nutrient management.

Keywords: Horticulture; NPK Fertilizer; Nutrient Management; Productivity; Sustainable Agriculture

1. INTRODUCTION

Sweet corn *(Zea mays saccharata*) has emerged as one of the most popular horticultural commodities in Indonesia, attracting growing interest from both farmers and consumers. Demand for sweet corn continues to rise in line with shifting dietary preferences toward healthier and more nutritious foods. Data from the Ministry of Agriculture (2021) indicate that sweet corn production in Indonesia has shown a positive trend over the past decade, particularly in key horticultural regions such as West Java, Central Java, and North Sumatra. Its high economic value lies in its versatility, as it can be marketed fresh, processed, or frozen. Research conducted by Sari et al. (2020) highlights the crop's considerable yield potential when cultivated with appropriate agronomic practices, including efficient and balanced fertilization. Moreover, sweet corn's relatively short growing cycle makes it well-suited for intensive farming systems and intercropping arrangements.

Plant growth and development are strongly influenced by the availability of nutrients in the soil. Crops require essential elements in optimal amounts and concentrations, maintained in a balanced condition within the soil. Fertilization plays a crucial role in replenishing nutrient losses and meeting plant requirements to enhance productivity. Fertilizers provide essential nutrients that support optimal growth and yield. Applying fertilizer at the appropriate dosage

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can significantly improve crop production. Nutrient requirements can be met through the use of inorganic fertilizers, which serve as an effective means of achieving high productivity (Siwanto et al., 2015). Inorganic fertilizers may be classified as single fertilizers or compound fertilizers, with the latter containing more than one macro- or micronutrient.

Primary macronutrients such as Nitrogen (N) are essential for maize growth, particularly in stimulating overall vegetative development, chlorophyll formation for photosynthesis, and the synthesis of proteins, lipids, and other organic compounds. Nitrogen deficiency can result in stunted growth, with plants appearing thin and dwarfed. Phosphorus (P) plays a critical role in promoting root development, supporting assimilation and respiration processes, and accelerating flowering as well as seed and fruit maturation. A lack of phosphorus often causes leaves to darken, with leaf margins, branches, and stems turning reddish-purple before eventually wilting. Potassium (K) contributes to protein and carbohydrate synthesis, strengthens plant structures to prevent leaf, flower, and fruit drop, and enhances tolerance to drought and disease. Potassium deficiency may lead to wrinkling and curling of older leaves, the appearance of reddish-brown spots, followed by leaf drying and death, while fruits remain undersized and of poor quality (DPPP Pontianak, 2018).

Compound NPK fertilizers such as 18-18-18 play a strategic role in modern agricultural systems by supplying balanced macronutrients. Research by Das and Ghosh (2021) demonstrated that biochar-based NPK formulations enhance the efficiency of nitrogen, phosphorus, and potassium utilization while simultaneously improving soil health and crop yields. In the case of sweet corn, a crop characterized by high nutrient demand, appropriate fertilization is a key determinant of successful cultivation. Pepó and Karancsi (2017) further emphasized that NPK fertilization increases nutrient concentrations in plant tissues, directly contributing to yield improvement. Fertilizer effectiveness is influenced not only by its nutrient composition but also by the plant's capacity to absorb and utilize these elements. Consequently, field trials are essential to verify that marketed fertilizers deliver significant agronomic benefits. Recent studies (Das and Ghosh, 2021) support that well-formulated fertilizers can reduce nutrient losses through leaching and improve agronomic efficiency. In addition, Chen et al. (2021) also explained on NPK nutrient interactions in maize systems and Rahman et al. (2022) explained on integrated NPK and organic amendments.

2. LITERATURE REVIEW

Sweet corn (*Zea mays saccharata*) requires balanced nutrient management to achieve optimal growth and productivity. Among the essential macronutrients, nitrogen (N), phosphorus (P), and potassium (K) play distinct but complementary roles in plant physiology. Nitrogen is a fundamental component of amino acids, proteins, nucleic acids, and chlorophyll, directly influencing photosynthetic capacity and vegetative vigor (Daroga et al., 2017; Fathi, 2022). Phosphorus contributes to energy transfer through ATP, root development, and reproductive processes, thereby enhancing kernel formation and crop maturation (Zhao et al., 2016). Potassium regulates osmotic balance, stomatal function, and enzyme activation, improving stress tolerance and carbohydrate translocation, which are critical for ear development (Beringer, 1980).

Previous studies have demonstrated that increasing NPK fertilizer dosages is positively correlated with plant height, stem diameter, and leaf number in maize (Pepó & Karancsi, 2017). Excessive nitrogen application, however, can lead to lodging, pest susceptibility, and environmental concerns due to N_2O emissions (Wahid, 2003). This study also demonstrated that NPK fertilization not only improves macronutrient uptake but also enhances micronutrient availability. It validates the broader agronomic benefits of balanced NPK application (Singh et al., 2024). This research found that foliar NPK application significantly improved maize yield. It complements your findings by showing that different application methods of NPK can enhance crop performance (Davis & Westfall, 2023).

Balanced compound fertilizers such as NPK 18-18-18 provide synchronized nutrient availability, ensuring that vegetative growth and yield components such as ear length, ear diameter, and ear weight are significantly improved compared with unfertilized controls. This study confirmed that NPK fertilizer significantly improved sweet corn growth and yield, highlighting the importance of balanced nutrient application across different planting systems. It supports the finding that NPK 18-18-18 enhances vegetative growth and productivity compared with control treatments (Zain et al., 2024). This study also found that NPK dosage and sowing methods significantly influenced maize yield and quality. It supports the conclusion that optimal NPK levels improve both vegetative and reproductive traits in sweet corn (Laghari et al., 2024). Although focused on micronutrients, this study emphasizes the synergy between macro- and micronutrients. It complements your findings by showing that balanced fertilization strategies maximize sweet corn productivity (Mulyana et al., 2025).

Relative Agronomic Effectiveness (RAE) has been widely used as a measure of fertilizer efficiency, with values ≥ 95% indicating effective nutrient input. Studies highlight that moderate NPK dosages often achieve high RAE values, balancing yield improvement with input efficiency, while excessive dosages may maximize yield but compromise sustainability. This research demonstrated that combining NPK with organic inputs improved maize yield stability. It reinforces the sustainability aspect of using moderate NPK doses, aligning with findings on RAE efficiency at 0,75 NPK *(*Adzikro et al., 2025). This study highlighted that nitrogen efficiency improvements through organic amendments. It strengthens your argument that moderate NPK dosages (0,75–1,00) are more efficient and sustainable than excessive inputs *(*Purwanto et al., 2025). Thus, the literature underscores the importance of optimizing NPK fertilizer application to enhance sweet corn productivity while maintaining economic and environmental sustainability. This research showed that organic fertilizers can complement NPK in improving sweet corn productivity. This also supports recommendation for efficient fertilizer use to reduce costs and environmental impacts (Kurniawan & Maghfoer, 2024).

3. RESEARCH METHODS

The field experiment to evaluate the NPK 18-18-18 fertilizer was conducted from July to October 2025 at the Sindang Barang Experimental Farm. Soil analysis was carried out at the Testing Laboratory, Department of Agronomy and Horticulture, Faculty of Agriculture, IPB University, Bogor.

The materials used in this experiment included hybrid F1 sweet corn seeds of the Exotic Pertiwi variety, NPK 18-18-18 fertilizer, Urea, SP-36, KCl, and pesticides. The tools employed comprised standard cultivation equipment (hoes, hand weeders, sprayers), a camera for documentation, and bamboo stakes for sample plants. Data processing was carried out using a computer equipped with the SAS statistical analysis program.

The evaluation of NPK 18-18-18 fertilizer on sweet corn *(Zea mays saccharata*) was conducted using a Randomized Complete Block Design (RCBD). The experimental treatments for inorganic fertilizer with established recommended dosages consisted of six levels: (P0) control, (P1) standard NPK, (P2) 0,5 NPK, (P3) 0,75 NPK, (P4) 1,0 NPK, and (P5) 1,5 NPK. Each treatment was replicated four times, with replications serving as blocks. In total, 24 experimental plots were evaluated.

Land preparation was carried out by hoeing the soil to a depth of 25 cm, followed by the application of basal fertilizers consisting of goat manure at 10 tons/ha and dolomite at 2 tons/ha. Sweet corn seeds were planted by making holes using a dibble stick, with a spacing of

75 cm × 25 cm. Each hole was sown with two sweet corn seeds along with Furadan. At four weeks after planting, thinning was performed to retain one plant per hole.

The standard dosage of inorganic fertilizers for maize was determined based on the recommended nutrient requirements of N, P, and K, namely 135 kg N/ha, 72 kg P_2O_5/ha, and 120 kg K_2O/ha (equivalent to ~300 kg Urea, 200 kg SP-36, and 200 kg KCl per hectare). The nutrient composition of the standard NPK fertilizer (NPK-std) used consisted of Urea (45% N), SP-36 (36% P_2O_5), and KCl (60% K_2O), all of which are commercially available and have been tested for effectiveness. SP-36 was applied entirely at planting, while NPK 18-18-18, Urea, and KCl were applied at planting and again at four weeks after planting (WAP), each at half of the total dosage. The specific fertilizer dosages for each treatment are presented in Table 1. Urea, SP-36, and KCl were applied in furrows located to the right or left along the crop rows.

Table 1. Fertilizer dosage details for the effectiveness test of NPK 18-18-18

Treatment	NPK 18-18-18 (kg/ha)	Urea (kg/ha)	SP-36 (kg/ha)	KCL (kg/ha)
P0: Control	0	0	0	0
P1: NPK Standard	0	300	200	200
P2: 0,5 NPK	200	70	0	40
P3: 0,75 NPK	300	105	0	60
P4: 1,0 NPK	400	140	0	80
P5: 1,5 NPK	600	210	0	120

Vegetative observations included plant height, leaf number, and stem diameter, recorded at 4, 6, and 8 weeks after planting (WAP) on 10 sample plants per plot. Sweet corn was harvested at approximately 10–11 WAP. The yield parameters measured from 10 sample plants per plot were: (1) ear weight with husk, (2) ear weight without husk, (3) ear length without husk, and (4) ear diameter without husk. In addition to the sample plants, ears with husks and filled kernels were harvested from each plot, excluding border plants, for productivity assessment. The weight of the husked and filled ears from each plot was then measured.

Fertilizers are considered to pass the technical effectiveness test if the inorganic fertilizer treatments under evaluation show statistically similar or higher results compared to the standard fertilizer treatment (reference) or perform better than the control at the 5% significance level, and if the Relative Agronomic Effectiveness (RAE) value of the tested fertilizer is greater than or equal to 95%. The agronomic effectiveness of inorganic fertilizers is determined using the Relative Agronomic Effectiveness (RAE) method (Mackay et al., 1984; Nurdin et al., 2020), with the following formula:

$$\text{RAE} = \frac{\text{corn productivity from tested fertilizers} - \text{control}}{\text{corn productivity from comparison fertilizer} - \text{control}} \times 100\%$$

All collected data were analyzed using analysis of variance (ANOVA) with the F-test in SAS software. When significant differences were detected, mean separation was performed using Duncan's Multiple Range Test (DMRT) at a 5% significance level.

4. RESULTS AND DISCUSSION

General Conditions of Experiment

The quality test results of NPK 18-18-18 fertilizer are presented in Table 2. The analysis showed that the fertilizer contained 18,06% total nitrogen, 20,29% total phosphorus (as P_2O_5), and 18,85% potassium (as K_2O), with a combined nutrient content ($N + P_2O_5 + K_2O$) of 57,20%. The moisture content was 0,66%, while heavy metal contaminants were detected at 0,00384 mg/kg Cd, 10,11 mg/kg Pb, 0,12 mg/kg Hg, and 0,53 mg/kg as (Table 2). These results confirm that the fertilizer meets the quality requirements of the Indonesian National Standard (SNI) for NPK products.

Tabel 2. Analysis Results of NPK 18-18-18 Fertilizer

Testing Parameters	Unit	Test Results
N-Total	%	18,06
P-Total as P_2O_5	%	20,29
K as K_2O	%	18,85
Total N+ P_2O_{5+} K_2O	%	57,20
Water Content	%	0,66
Cd	mg/kg	0,00384
Pb	mg/kg	10,11
Hg	mg/kg	0,12
As	mg/kg	0,53

Soil analysis was conducted prior to the experiment by collecting samples from all treatment plots, which were then composited. The purpose of the soil test was to determine the fertility status of the experimental site before the trial. The results of the soil analysis are presented in Table 3.

Table 3. Soil analysis results before the experiment

Parameter	Unit	Value	Category*
pH H_2O		5,38	Sour
C-organic	%	2,13	Medium
N-total	%	0,25	Medium
P-available (Bray I)	ppm P_2O_5	45,4	Very high
CEC	cmol kg^{-1}	19,34	Medium
K-dd	cmol K kg^{-1}	0,86	High
P-Potential	mg P_2O_5 100 g^{-1}	155	Very high
K-Potential	mg K_2O 100 g^{-1}	31,7	Medium

*Source: Balai Penelitian Tanah (2023)

The analysis of variance revealed that the application of NPK 18-18-18 fertilizer had a highly significant effect on both growth and yield components of sweet corn. The coefficients of variation (CV) for growth parameters ranged from 2,92% to 8,31% for plant height, 5,09% to 12,29% for stem diameter, 1,91% to 5,70% for leaf number, and 15,69% for biomass weight. For yield components, the CV ranged from 3,14% to 15,45%, with the lowest variation observed in ear length and the highest in ear weight with husk (Table 4).

Table 4. Recapitulation of analysis variance

Variable	Treatment	Coefficient of Variance (%)
Growth Component:		
Plant height		
4 WAP	**	8,29
6 WAP	**	8,31
8 WAP	**	2,92
Stem diameter		
4 WAP	**	12,29
6 WAP	**	6,41
8 WAP	**	5,09
Leaf number		
4 WAP	**	5,70
6 WAP	**	4,36
8 WAP	**	1,91
Biomass Weight	**	15,69
Yield Component:		
Ear length without husk	**	3,14
Ear diameter without husk	**	8,36
Ear weight with husk	**	15,45
Ear weight without husk	**	14,20
Plot Yield	**	12,55
Productivity	**	12,56

Note: *Significant at α=5% level, ** Significant at α=1% level

Effect of NPK 18-18-18 Fertilizer on the Growth Components of Sweet Corn

The analysis of variance indicated that the application of NPK 18-18-18 fertilizer had a highly significant effect on plant height from 4 to 8 weeks after planting (WAP) (Table 5). The mean plant height obtained across treatments at each observation period ranged from 68,94 to 86,64 cm at 4 WAP, 88,17 to 150,03 cm at 6 WAP, and 135,92 to 205,72 cm at 8 WAP.

The application of NPK 18-18-18 fertilizer from 4 to 8 weeks after planting (WAP) had a highly significant effect on plant height compared with the control treatment. Fertilizer dosages ranging from 0,50 to 1,50 NPK produced greater plant height than the control across all observation periods (4–8 WAP).

Table 5. Plant height at different application rates of NPK 18-18-18 fertilizer

Treatment	Plant Height (cm)		
	4 WAP	6 WAP	8 WAP
Control	68,94[b]	88,17[b]	135,92[d]
NPK Standard	80,76[a]	140,70[a]	204,97[a]
0,50 NPK	80,65[a]	136,22[a]	191,77[c]
0,75 NPK	85,09[a]	149,95[a]	205,72[a]
1,00 NPK	84,77[a]	150,03[a]	201,65[ab]
1,50 NPK	86,64[a]	148,50[a]	195,65[bc]

Note: number followed by different letters in the same column indicate significant differences based on the results of DMRT α 5% test.

The application of NPK 18-18-18 fertilizer had a highly significant effect on stem diameter from 4 to 8 weeks after planting (WAP) (Table 6). The mean stem diameter obtained across treatments at each observation period ranged from 7,41 to 15,12 mm at 4 WAP, 12,38 to 17,29 mm at 6 WAP, and 16,21 to 20,47 mm at 8 WAP. Fertilizer dosages ranging from 0,50 to 1,50 NPK produced significantly greater stem diameters compared with the control treatment across all observation periods (4–8 WAP).

Table 6. Stem Diameter at Different Application Rates of NPK 18-18-18 Fertilizer

Treatment	Stem Diameter (mm)		
	4 WAP	6 WAP	8 WAP
Control	7,41[b]	12,38[b]	16,21[c]
NPK Standard	14,39[a]	16,26[a]	19,28[ab]
0,50 NPK	13,32[a]	15,70[a]	18,19[b]
0,75 NPK	14,64[a]	17,29[a]	19,53[ab]
1,00 NPK	13,38[a]	16,13[a]	19,59[ab]
1,50 NPK	15,12[a]	17,29[a]	20,47[a]

Note: number followed by different letters in the same column indicate significant differences based on the results of DMRT α 5% test.

The results presented in Table 7 indicate that the application of NPK 18-18-18 fertilizer had a highly significant effect on leaf number from 4 to 8 weeks after planting (WAP). The mean leaf number obtained across treatments at each observation period ranged from 6,01 to 7,67 leaves at 4 WAP, 7,40 to 11,42 leaves at 6 WAP, and 8,87 to 13,00 leaves at 8 WAP. Fertilizer dosages ranging from 0,50 to 1,50 NPK produced significantly greater leaf numbers compared with the control treatment across all observation periods (4–8 WAP).

Table 7. Leaf number at different application rates of NPK 18-18-18 fertilizer

Treatment	Leaf number		
	4 WAP	6 WAP	8 WAP
Control	6,01[b]	7,40[c]	8,87[b]
NPK Standard	7,35[a]	10,90[ab]	12,80[a]
0,50 NPK	7,12[a]	10,62[b]	12,85[a]
0,75 NPK	7,67[a]	10,77[ab]	12,85[a]
1,00 NPK	7,40[a]	11,42[a]	13,00[a]
1,50 NPK	7,42[a]	10,95[ab]	12,87[a]

Note: number followed by different letters in the same column indicate significant differences based on the results of DMRT α 5% test.

Effect of NPK 18-18-18 Fertilizer on the Yield Components of Sweet Corn

The analysis of variance demonstrated that the application of NPK 18-18-18 fertilizer had a highly significant effect on ear length and diameter of sweet corn (Table 8). The mean ear length obtained in this experiment ranged from 15,41 to 20,89 cm, while the mean ear diameter ranged from 36,05 to 49,65 mm. Fertilizer dosages between 0,50 and 1,50 NPK produced significantly greater ear length and diameter compared with the control treatment.

Table 8. Ear Length and Ear Diameter at Different Application Rates of NPK 18-18-18 Fertilizer

Treatment	Ear Length (cm)	Ear Diameter (mm)
Control	15,41[c]	36,05[b]
NPK Standard	20,51[ab]	47,80[a]
0,50 NPK	19,75[b]	46,33[a]
0,75 NPK	20,43[ab]	43,70[a]
1,00 NPK	20,89[a]	49,65[a]
1,50 NPK	20,85[a]	48.05[a]

Note: number followed by different letters in the same column indicate significant differences based on the results of DMRT α 5% test.

The application of NPK 18-18-18 fertilizer had a highly significant effect on biomass weight, ear weight with husk, and ear weight without husk of sweet corn (Table 9). The mean biomass weight obtained in this experiment ranged from 0,12 to 0,34 kg. Meanwhile, the mean ear weight with husk and without husk ranged from 0,13 to 0,34 kg and 0,12 to 0,28 kg, respectively. Fertilizer dosages between 0,50 and 1,50 NPK produced significantly greater biomass weight, ear weight with husk, and ear weight without husk compared with the control treatment.

The application of NPK 18-18-18 fertilizer had a highly significant effect on plot-level yield and productivity of sweet corn (Table 10). The mean values obtained for plot yield and productivity ranged from 7,91 to 25,46 kg and 5,02 to 16,16 t/ha, respectively. Fertilizer dosages between 0,50 and 1,50 NPK produced significantly greater plot yield and productivity compared with the control treatment.

Table 9. Yield Component and Biomass Weight at Different Application Rates of NPK 18-18-18 Fertilizer

Treatment	Biomass Weight (kg)	Ear Weight With Husk (kg)	Ear Weight Without Husk (kg)
Control	0,12[c]	0,13[c]	0,12[b]
NPK Standard	0,27[b]	0,27[b]	0,28[a]
0,50 NPK	0,24[b]	0,24[b]	0,23[a]
0,75 NPK	0,26[b]	0,26[b]	0,25[a]
1,00 NPK	0,28[b]	0,28[b]	0,28[a]
1,50 NPK	0,34[a]	0,34[a]	0,28[a]

Note: number followed by different letters in the same column indicate significant differences based on the results of DMRT α 5% test.

Table 10. Plot Yield and Productivity at Different Application Rates of NPK 18-18-18 Fertilizer

Treatment	Plot Yield (kg)	Productivity (ton/ha)
Control	7,91[c]	5,02[c]
NPK Standard	22,66[ab]	14,38[ab]
0,50 NPK	19,61[b]	12,45[b]
0,75 NPK	22,82[ab]	14,49[ab]
1,00 NPK	25,25[a]	16,03[a]
1,50 NPK	25,46[a]	16,16[a]

Note: number followed by different letters in the same column indicate significant differences based on the results of DMRT α 5% test.

Relative Agronomic Effectiveness (RAE) is a measure of fertilizer effectiveness. A fertilizer is considered effective if it achieves an RAE value of ≥ 95%. This threshold indicates that the fertilizer can provide a greater yield increase compared with the yield improvement obtained from the reference fertilizer relative to the control.

The RAE values of NPK 18-18-18 fertilizer are presented in Table 11. The calculation results indicate that the fertilizer was effective when applied at dosages of 0,75, 1,00, and 1,50 NPK. The highest effectiveness was obtained at the 1,50 NPK dosage, with an RAE value of 118%. However, application at the 0,75 NPK dosage provided a significant advantage in terms of fertilizer savings in the field, with an RAE value of 101%. This result implies that the use of NPK 18-18-18 fertilizer at a dosage of 0,75 NPK can increase yield by 1,01 times compared with the yield improvement obtained from the reference fertilizer relative to the control.

Table 11. Relative Agronomic Effectiveness (RAE) value at different application rates of NPK 18-18-18 fertilizer

Treatment	RAE (%)
Control	-
NPK Standard	-
0,50 NPK	79,33
0,75 NPK	101,10
1,00 NPK	117,59
1,50 NPK	118,98

The experimental results demonstrated that the application of NPK 18-18-18 fertilizer had a highly significant effect on vegetative growth and yield components of sweet corn, with statistically greater values compared with the control treatment. Fertilizer dosages ranging from 0.50 to 1.50 NPK generally resulted in higher plant height, stem diameter, leaf number, ear length, ear diameter, biomass weight, ear weight with husk, ear weight without husk, plot yield, and overall productivity compared with the control. These findings are consistent with Pepó and Karancsi (2017), who reported that increasing NPK fertilizer dosage is positively correlated with increases in plant height, stem diameter, and leaf number.

Nitrogen, phosphorus, and potassium in compound fertilizers are essential nutrients required by plants, each playing distinct physiological roles. Although these macronutrients are needed in large quantities, their availability in the soil is often insufficient to meet crop demands, necessitating external supplementation. Nitrogen is a fundamental component of organic compounds such as amino acids, proteins, and nucleic acids (Daroga et al., 2017; Fathi, 2022). N fertilizer plays a crucial role in increasing maize production, as nitrogen is the primary element in chlorophyll, which is vital for photosynthesis. Nitrogen deficiency leads to leaf yellowing and reduced photosynthetic efficiency. In addition, nitrogen contributes to the synthesis of amino acids, proteins, and structural cell components. However, excessive nitrogen application in maize can increase susceptibility to pests and diseases, particularly during the rainy season, prolong crop maturity, and cause lodging due to excessive vegetative growth unsupported by root strength. Overuse of nitrogen fertilizers not only raises production costs but also contributes to environmental damage through N_2O emissions during ammonification, nitrification, and denitrification processes (Wahid, 2003). Phosphorus (P) is essential for energy formation (ATP), root development, and crop maturation, and strongly influences the productivity of food crops such as sweet corn (Zhao et al., 2016). Potassium (K) is closely related to biophysical and biochemical processes in plants. It plays a key role in regulating osmotic pressure and turgor, which in turn affect cell growth and development as well as stomatal opening and closure (Beringer, 1980).

An increase in both growth and yield components was observed in this experiment following the application of the tested fertilizer dosages. The application of NPK 18-18-18 fertilizer at dosages ranging from 0,50 to 1,50 NPK resulted in significantly greater growth and yield components compared with the control treatment. The calculation of Relative Agronomic Effectiveness (RAE) indicated that the fertilizer was effective when applied at dosages of 0,75, 1,00, and 1,50 NPK. The highest effectiveness was achieved at the 1,50 NPK dosage, with an RAE value of 118%. However, application at the 0,75 NPK dosage provided a practical advantage in terms of fertilizer savings, with an RAE value of 101%. This finding implies that the use of NPK 18-18-18 fertilizer at a dosage of 0,75 NPK can increase yield by 1,01 times compared with the yield improvement obtained from the reference fertilizer relative to the control. These results further indicate that NPK 18-18-18 fertilizer, when applied at an appropriate dosage, can be effectively utilized in sweet corn cultivation by carefully considering crop nutrient requirements and the precise balance of N, P_2O_5, and K_2O.

5. CONCLUSION AND SUGGESTION

The results of the study demonstrated that the application of NPK 18-18-18 fertilizer had a highly significant effect on vegetative growth and yield components of sweet corn, with statistically greater values compared with the control treatment. Fertilizer dosages ranging from 0,50 to 1,50 NPK generally produced higher plant height, stem diameter, leaf number, ear length, ear diameter, biomass weight, ear weight with husk, ear weight without husk, plot yield, and overall productivity compared with the control.

The calculation of Relative Agronomic Effectiveness (RAE) showed that the fertilizer was effective when applied at dosages of 0,75, 1,00, and 1,50 NPK. The highest effectiveness was observed at the 1,50 NPK dosage, with an RAE value of 118%. However, application at the 0,75 NPK dosage provided a significant advantage in terms of fertilizer savings, with an RAE value of 101%. This result implies that the use of NPK 18-18-18 fertilizer at a dosage of 0,75 NPK can increase yield by 1,01 times compared with the yield improvement obtained from the reference fertilizer relative to the control. Applying lower fertilizer dosages can reduce production costs, mitigate fertilizer scarcity, and enhance the overall efficiency of fertilizer use.

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