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*Article*

# Optimizing potassium fertilization and leaf pruning strategies to enhance growth performance and yield of sweet corn (*Zea mays saccharata* Sturt L.)

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**Abstract**

Declining sweet corn production and the inability of the domestic supply to fully meet market demand highlight the need for effective agronomic strategies to improve crop productivity and quality in Indonesia. This study evaluated the effects of KCl-derived potassium rates and leaf pruning on the growth and yield performance of sweet corn (*Zea mays saccharata* Sturt L.). A 3 × 4 factorial experiment was arranged in a completely randomized design with three replications. Potassium was applied at 50, 100, and 150 kg K2O ha$^{-1}$, while leaf pruning treatments consisted of 0, 1, 3, and 5 leaves. Data were analyzed using analysis of variance (ANOVA), followed by Tukey's Honestly Significant Difference (HSD) test at the 5% significance level ($p < 0.05$), using SPSS software. Potassium rate significantly affected plant height (205,08 cm), stem diameter (21,60 mm) , flowering time (43,08 DAP), and sweetness content (13,33 °Brix) whereas leaf pruning significantly influenced leaf number (12,00) , ear weight (213,22 g plant$^{-1}$), and ear length (21,11 cm). Significant interaction effects were observed for ear weight (255 g plant$^{-1}$), ear diameter (46,77 mm), and sweetness content (14,00 °Brix). The application of 100 kg K2O ha$^{-1}$ improved plant height (3,78%), stem diameter (9,26%), and increased sweetness (7,08%), while pruning 1–3 leaves enhanced ear weight (9,49 – 16,47%) and ear length (6,03 – 10,00%). These findings suggest that moderate potassium fertilization combined with selective leaf pruning can improve both the productivity and quality of sweet corn.

**Keywords:** sweet corn; potassium fertilization; KCl; leaf pruning; growth; yield quality

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## 1. Introduction

Sweet corn (*Zea mays saccharata* Sturt L.) is an economically important horticultural crop widely consumed for its sweet flavor, nutritional value, and rising market demand. Its eating quality is closely related to kernel sweetness, moisture content, and total sugar concentration, while its nutritional value contributes to consumer preference (Ledenčan et al., 2022; Baranowska, 2023; Sidahmed et al., 2025). In Indonesia, domestic maize production has declined, from 16.53 million tons in 2022 to 14.46 million tons in 2023, or approximately 12.5% (BPS, 2024). Although these data refer to maize production in general rather than sweet corn specifically, they indicate broader constraints in maize-based production systems. Therefore, effective agronomic practices are required to improve sweet corn productivity and quality under local cultivation conditions.

Potassium is an essential macronutrient involved in photosynthesis, enzyme activation, stomatal regulation, carbohydrate metabolism, assimilate transport, and sugar accumulation. In horticultural crops, potassium plays an important role in improving yield and quality by contributing to sugar assimilation and translocation (Shah et al., 2024). In maize, adequate potassium supply has also been reported to enhance photosynthetic performance, dry matter accumulation, and yield formation (Fan et al., 2022). Thus, potassium availability is important for sweet corn growth, ear development, kernel filling, and sweetness quality.

In addition to nutrient management, leaf pruning may improve crop performance by modifying canopy structure and source–sink relationships. Proper pruning can reduce self-shading, improve light penetration, and enhance assimilate allocation toward developing ears. However, excessive leaf removal may reduce photosynthetic leaf area and limit assimilate production, thereby lowering yield. Recent studies have shown that canopy structure, light interception, and defoliation intensity can strongly influence maize growth and yield formation (Duan et al., 2024; Tashiro et al., 2024).

Although potassium fertilization and leaf pruning have been studied separately, their combined effects on sweet corn growth, yield, and sweetness quality remain limited. This interaction is important because potassium supports assimilate transport and sugar accumulation, whereas pruning regulates canopy efficiency and assimilate partitioning. Source–sink coordination is a key factor in determining maize yield during reproductive development (Deng et al., 2023). Therefore, this study was conducted to evaluate the individual and interactive effects of KCl-derived potassium fertilization and leaf pruning intensity on vegetative growth, yield components, harvest index, and sweetness content of sweet corn under field conditions.

## 2. Materials and Methods

### *2.1. Experimental site and soil condition*

The experiment was conducted from April to June 2025 in an open field located in Kembangan Village, Kebomas District, Gresik Regency, East Java, Indonesia. The experimental site was situated at approximately 4,5 m above sea level, with an average temperature of 25 – 28 °C and relative humidity of 75 – 80 % during the growing period. The growing medium was topsoil, commonly used for sweet corn cultivation.

Before planting, composite soil samples were collected from the experimental area at 0–20 cm depth. The analyzed parameters included total nitrogen, total $P_2O_5$, total $K_2O$, organic carbon, C/N ratio, and soil pH. The initial soil analysis showed low fertility, particularly in phosphorus and potassium availability, which justified the application of potassium fertilizer in this study (Table 1).

**Table 1.** Soil chemical properties before the experiment

| Soil properties | Soil analysis result | Criteria |
|---|---|---|
| N-Total (%) | 0,20 | Low |
| $P_2O_5$-Total (mg/100g) | 0,26 | Very low |
| $K_2O$-Total (mg/100g) | 0,01 | Very low |
| C-Organik (%) | 1,43 | Low |
| C/N Rasio | 6,98 | Low |
| pH | 8,58 | Slightly alkaline |

*2.2. Experimental design and treatments*

The experiment was arranged in a 3 × 4 factorial design using a Completely Randomized Design with three replications, resulting in 36 experimental units. The first factor was potassium fertilizer rate supplied as KCl, with three levels: 50, 100, and 150 kg $K_2O$ $ha^{-1}$, corresponding to approximately 83, 167, and 250 kg KCl $ha^{-1}$, respectively. The second factor was leaf pruning intensity, with four levels: 0 pruning, 1 leaf, 3 leaves, and 5 leaves. Each experimental unit consisted of 36 polybag plants. The size of each experimental plot was 3,5 m × 3,5 m, with a spacing of 15 cm × 15 cm. Bonanza sweet corn was used as the planting material.

*2.3. Crop management*

The land was prepared by clearing weeds, loosening the soil, and forming experimental plots according to the experimental layout. Sweet corn seeds were sown in seedling trays/media and transplanted into the field 9 days after sowing. One healthy seedling was maintained per planting hole.

Basic fertilization was applied with urea and TSP at recommended rates for sweet corn cultivation: 435 kg $ha^{-1}$ and 335 kg $ha^{-1}$, respectively. Potassium fertilizer was applied as KCl at the specified levels. Fertilizer was applied at 7-day intervals by placing it around the plant base and lightly covering it with soil. Irrigation was applied once daily as needed, depending on rainfall, to maintain adequate soil moisture during the growing period. Weed control was carried out manually at 14, 28, and 42 days after planting. No severe pest or disease incidence occurred during the experiment.

*2.4. Leaf pruning treatment*

Leaf pruning was conducted at 50 days after planting. The pruning treatment was applied by removing lower leaves according to the assigned treatment level: 0, 1, 3, or 5 leaves per plant. Only fully expanded lower leaves were removed using clean scissors to minimize plant injury. Pruning was carried out in the morning to reduce plant stress and allow faster wound recovery.

*2.5. Observed variables*

The observed variables included vegetative growth, yield components, and yield quality. Vegetative growth variables consisted of plant height, number of leaves, stem diameter, and flowering time. Plant height was measured from the soil surface to the plant's highest point using a measuring tape. Stem diameter was measured at 5 cm above the soil surface using a vernier caliper. Flowering time was recorded as the number of days after planting until 50% of plants in each experimental unit produced tassels.

Yield components consisted of the number of ears per plant, ear weight, ear length, ear diameter, sweetness content, and harvest index. Ear weight was measured using a digital balance after harvest. Ear length and ear diameter were measured using a ruler and caliper, respectively. Sweetness content was measured in °Brix using a hand refractometer by extracting juice from fresh kernels. Harvesting was conducted at 71 days after planting. Harvest index was calculated as the ratio of economic yield to total plant biomass using the following formula: Harvest index = economic yield / total plant biomass

*2.6. Statistical analysis*

All data were subjected to analysis of variance to determine the effects of potassium dose, leaf pruning, and their interaction. Before analysis, the data were tested for normality using the Shapiro–Wilk test and for homogeneity of variance using Levene’s test. When treatment effects were significant, mean comparisons were performed using the

Honestly Significant Difference test (HSD) at the 5% significance level. Statistical analysis was conducted using SPSS version 25.0.

## 3. Results

Analysis of variance showed that potassium dose significantly affected plant height, stem diameter, flowering time, and sweetness content. Leaf pruning significantly affected leaf number, ear weight, and ear length. Significant interaction effects between potassium dose and leaf pruning were observed for ear weight, ear diameter, and sweetness content. In contrast, the number of ears per plant and harvest index were not significantly affected by potassium dose, leaf pruning, or their interaction (Table 2).

**Table 2.** Summary of analysis of variance showing the effect of potassium dose, leaf pruning, and their interaction on corn parameters

| Parameter | Potassium dose | Leaf pruning | Interaction |
|---|---|---|---|
| Plant height | * | ns | ns |
| Number of leaves | ns | * | ns |
| Stem diameter | * | ns | ns |
| Flowering time | * | ns | ns |
| Number of ears per plant | ns | ns | ns |
| Ear weight | ns | * | * |
| Ear length | ns | * | ns |
| Ear diameter | ns | ns | * |
| Sweetness content | * | ns | * |
| Harvest index | ns | ns | ns |

*indicate statistically significant effects at $p < 0.05$, while "ns" denotes non-significant effects.

### *3.1. Effects of potassium dose and leaf pruning on plant growth of sweet corn*

Potassium application improved vegetative growth, particularly plant height and stem diameter. The application of 100 kg $K_2O$ $ha^{-1}$ increased plant height from 197.33 cm to 203.25 cm, while 150 kg $K_2O$ $ha^{-1}$ produced a similar value of 205.08 cm (Figure 1). Stem diameter also increased from 19.60 mm at 50 kg $K_2O$ $ha^{-1}$ to 21.06 mm at 100 kg $K_2O$ $ha^{-1}$ (Figure 3). In addition, potassium application significantly affected flowering time. Plants treated with 50 kg $K_2O$ $ha^{-1}$ showed the latest flowering time at 43.08 days after planting, whereas 100 kg $K_2O$ $ha^{-1}$ promoted earlier flowering at 41.58 days after planting. The 150 kg $K_2O$ $ha^{-1}$ treatment produced an intermediate flowering time of 42.25 days after planting (Figure 4). These results indicate that moderate potassium application was sufficient to improve vegetative growth and accelerate flowering, as increasing the dose to 150 kg $K_2O$ $ha^{-1}$ did not produce a further significant improvement.

Leaf pruning significantly reduced the number of leaves, as expected from the treatment application. Plants without pruning and those pruned by one leaf had the highest number of leaves, with 12.22 and 12.00 leaves, respectively. More intensive pruning reduced the number of leaves to 9.22 leaves under three-leaf pruning and 7.56 leaves under five-leaf pruning (Figure 2). However, pruning did not significantly affect plant height, stem diameter, or flowering time. Flowering time across pruning treatments ranged only from 41.89 to 42.56 days after planting, indicating that leaf pruning did not substantially alter floral initiation (Figure 4).

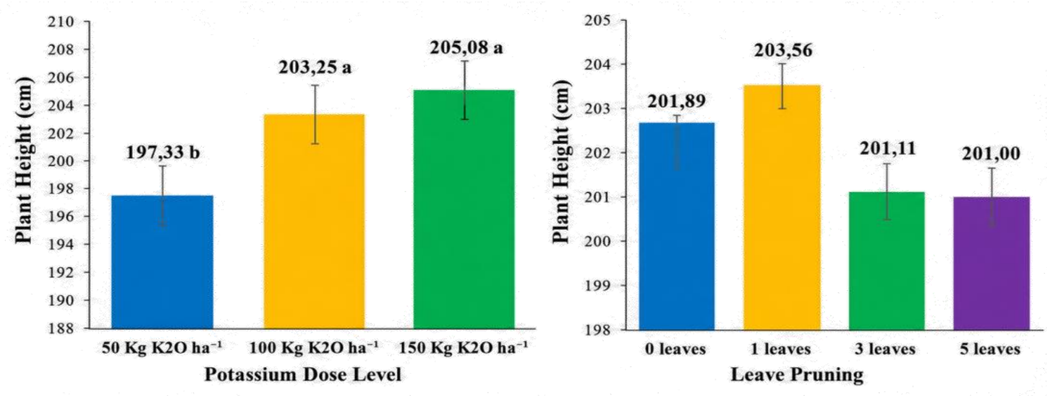


**Figure 1.** Effect of potassium dose and leaf pruning on sweet corn plant height. Different letters above bars indicate significant differences based on Tukey's HSD test at p < 0.05. Error bars represent standard error.

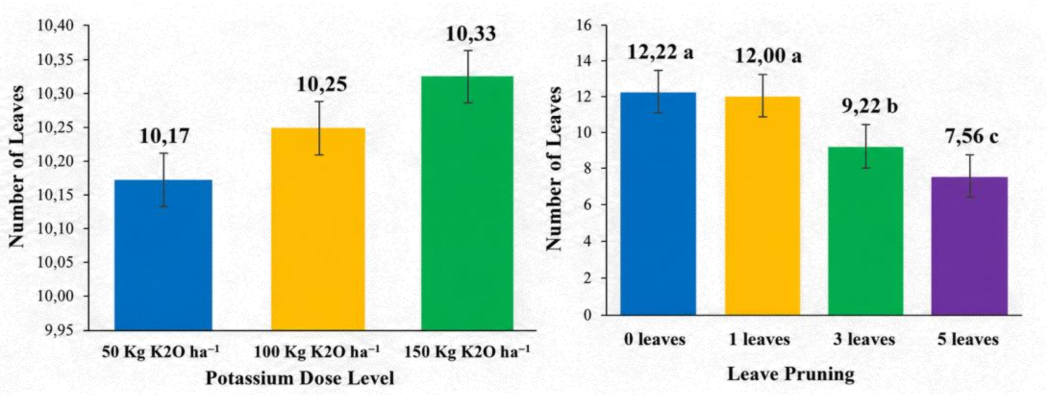


**Figure 2.** Effect of potassium dose and leaf pruning on the number of leaves of sweet corn. Different letters above bars indicate significant differences based on Tukey's HSD test at p < 0.05. Error bars represent standard error.

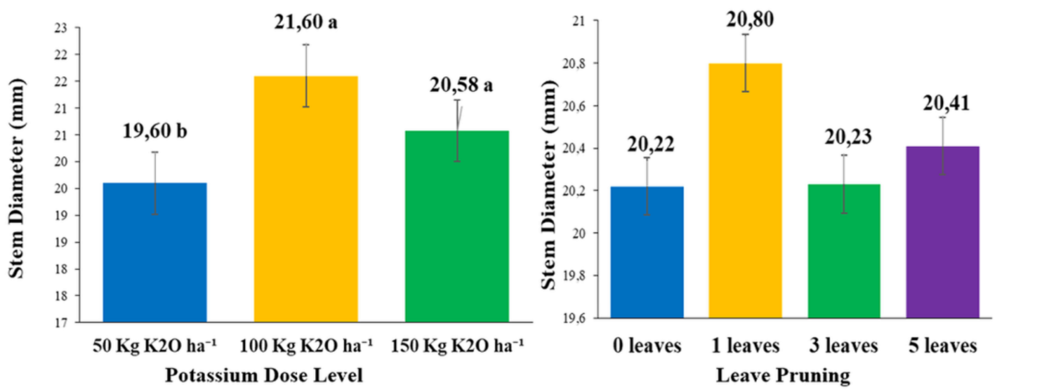


**Figure 3.** Effect of potassium dose and leaf pruning on stem diameter of sweet corn. Different letters above bars indicate significant differences based on Tukey's HSD test at p < 0.05. Error bars represent standard error.

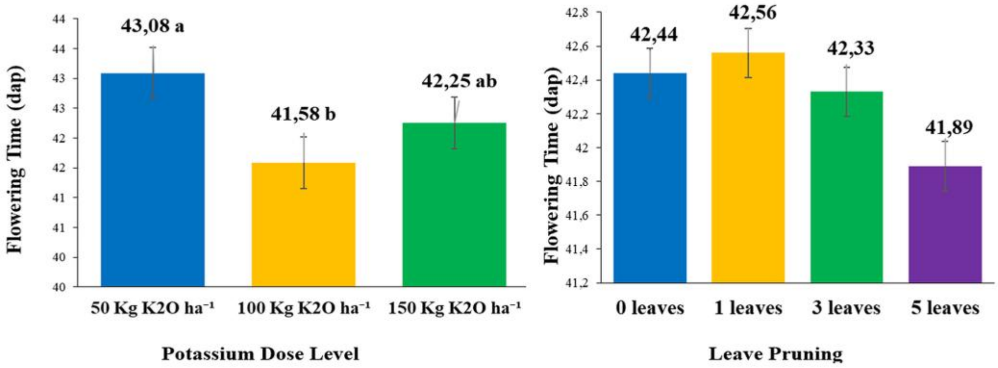


**Figure 4.** Effect of potassium dose and leaf pruning on sweet corn flowering time. Different letters above bars indicate significant differences based on Tukey's HSD test at $p < 0.05$. Error bars represent standard error.

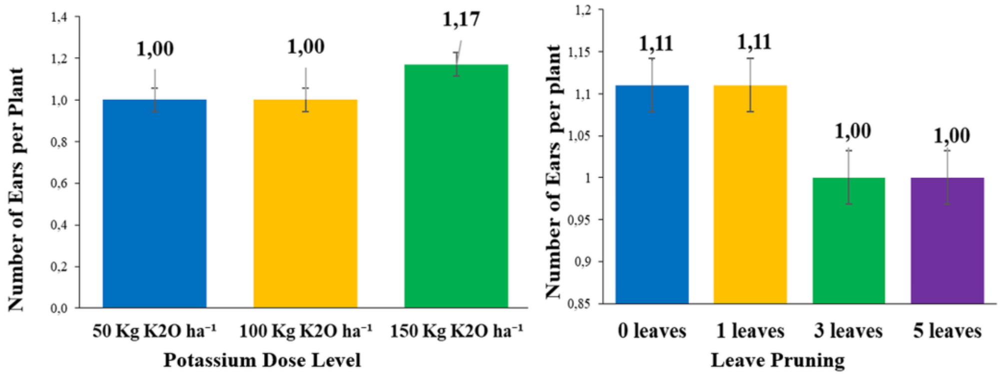


**Figure 5.** Effect of potassium dose and leaf pruning on the number of leaves of sweet corn. Different letters above bars indicate significant differences based on Tukey's HSD test at $p < 0.05$. Error bars represent standard error.

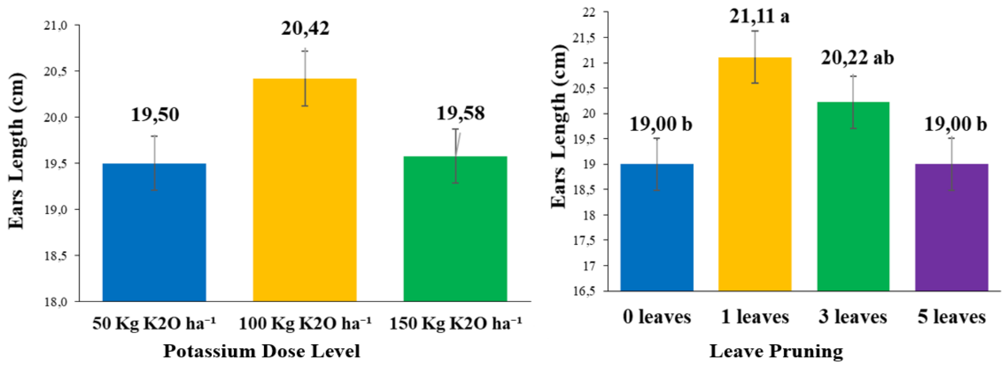


**Figure 6.** Effect of potassium dose and leaf pruning on the length of ears of sweet corn. Different letters above bars indicate significant differences based on Tukey's HSD test at $p < 0.05$. Error bars represent standard error.

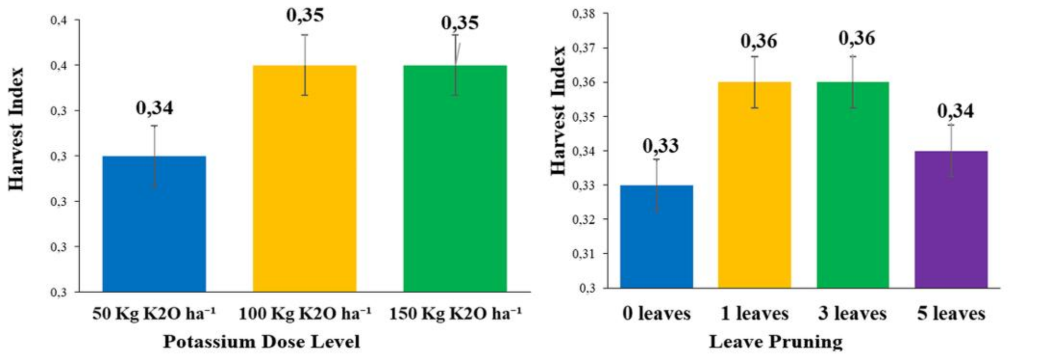


**Figure 7.** Effect of potassium dose and leaf pruning on harvest index of sweet corn. Different letters above bars indicate significant differences based on Tukey's HSD test at $p < 0.05$. Error bars represent standard error.

*3.2. Effect of potassium dose and leaf pruning on the yield components of sweet corn*

Analysis of variance indicated that the number of ears per plant was not significantly affected by either potassium dose or leaf pruning (Figure 5). However, ear weight was significantly influenced by leaf pruning and by the interaction between potassium dose and leaf pruning. The highest ear weight was obtained from the combination of 100 kg $K_2O$ $ha^{-1}$ and one-leaf pruning, reaching 255.00 g $plant^{-1}$. This value was higher than the lowest treatment combination, 150 kg $K_2O$ $ha^{-1}$ without pruning, which produced 147.00 g $plant^{-1}$. These findings suggest that ear weight was optimized by a balanced combination of potassium fertilization and mild pruning rather than by potassium application alone (Table 3).

Ear length was significantly affected by leaf pruning. The longest ears were observed under one-leaf pruning, with an average of 21.11 cm, followed by three-leaf pruning with 20.22 cm. In comparison, plants without pruning and those pruned by five leaves produced shorter ears, averaging 19.00 cm each. This result indicates that moderate pruning improved ear elongation, whereas excessive pruning did not provide additional benefit (Figure 6).

Ear diameter showed a significant interaction between potassium dose and leaf pruning. The highest ear diameter was recorded at 50 kg $K_2O$ $ha^{-1}$ without pruning, reaching 46.77 mm, whereas the lowest value was observed at 150 kg $K_2O$ $ha^{-1}$ without pruning, at 36.40 mm. This interaction indicates that ear diameter response depended on the specific combination of potassium dose and pruning intensity (Table 3).

Sweetness content was significantly affected by potassium dose and by the interaction between potassium dose and leaf pruning. Increasing potassium dose from 50 to 100 and 150 kg $K_2O$ $ha^{-1}$ increased sweetness content from 12.08 °Brix to 13.00 and 13.33 °Brix, respectively. The highest sweetness content was recorded at 100 kg $K_2O$ $ha^{-1}$ with five-leaf pruning, reaching 14.33 °Brix, followed by 150 kg $K_2O$ $ha^{-1}$ with one- and three-leaf pruning, both reaching 14.00 °Brix. These results show that potassium fertilization played an important role in improving sweetness, although the optimum response depended on pruning intensity (Table 3).

Harvest index was not significantly affected by potassium dose, leaf pruning, or their interaction. Mean harvest index values ranged only from 0.33 to 0.36 across pruning treatments and from 0.34 to 0.35 across potassium levels. This indicates that the treatments influenced several individual growth and yield traits but did not significantly alter biomass partitioning efficiency (Figure 7).

**Table 3.** Effect of potassium dose and leaf pruning on ear weight, ear diameter, and sweetness content of sweet corn

| Treatment | Ear weight (g plant$^{-1}$) | Ear diameter (mm) | Sweetness content (°bx) |
|---|---|---|---|
| 50 Kg $K_2O$ ha$^{-1}$ + 0 Leaves | 215.00$^{ab}$ | 46.77$^{a}$ | 12.00$^{ab}$ |
| 50 Kg $K_2O$ ha$^{-1}$ + 1 Leaves | 168.67$^{ab}$ | 43.03$^{ab}$ | 11.33$^{b}$ |
| 50 Kg $K_2O$ ha$^{-1}$ + 3 Leaves | 185.67$^{ab}$ | 41.90$^{ab}$ | 12.67$^{ab}$ |
| 50 Kg $K_2O$ ha$^{-1}$ + 5 Leaves | 164.67$^{ab}$ | 42.53$^{ab}$ | 12.33$^{ab}$ |
| 100 Kg $K_2O$ ha$^{-1}$ + 0 Leaves | 172.33$^{ab}$ | 40.13$^{ab}$ | 12.00$^{ab}$ |
| 100 Kg $K_2O$ ha$^{-1}$ + 1 Leaves | 255.00$^{a}$ | 43.23$^{ab}$ | 13.00$^{ab}$ |
| 100 Kg $K_2O$ ha$^{-1}$ + 3 Leaves | 227.00$^{ab}$ | 43.97$^{ab}$ | 12.67$^{ab}$ |
| 100 Kg $K_2O$ ha$^{-1}$ + 5 Leaves | 173.33$^{ab}$ | 40.07$^{ab}$ | 14.33$^{a}$ |
| 150 Kg $K_2O$ ha$^{-1}$ + 0 Leaves | 147.00$^{b}$ | 36.40$^{b}$ | 12.67$^{ab}$ |
| 150 Kg $K_2O$ ha$^{-1}$ + 1 Leaves | 216.00$^{ab}$ | 45.97$^{ab}$ | 14.00$^{a}$ |
| 150 Kg $K_2O$ ha$^{-1}$ + 3 Leaves | 177.67$^{ab}$ | 39.77$^{ab}$ | 14.00$^{a}$ |
| 150 Kg $K_2O$ ha$^{-1}$ + 5 Leaves | 159.67$^{b}$ | 44.40$^{ab}$ | 12.67$^{ab}$ |

Error bars represent standard error. Different letters among the treatments indicate a significant difference ($p < 0.05$)

## 4. Discussion

The results of this study show that potassium fertilization and leaf pruning affected sweet corn growth, yield, and quality through different mechanisms. Potassium mainly improved plant height, stem diameter, flowering time, and sweetness content, whereas pruning influenced leaf number, ear weight, and ear length. The significant interaction between potassium dose and pruning on ear weight, ear diameter, and sweetness indicates that sweet corn performance was determined by the balance between nutrient availability and canopy management. This is consistent with previous studies showing that maize productivity is strongly affected by crop management, nutrient supply, and environmental conditions (Jägermeyr et al., 2021; Yuan et al., 2024).

Potassium application, especially at 100 and 150 kg $K_2O$ ha$^{-1}$, increased plant height and stem diameter, suggesting that adequate K supported vegetative growth and plant structural development. Potassium plays an important role in photosynthesis, enzyme activation, stomatal regulation, carbohydrate transport, and water balance, all of which contribute to plant growth and biomass accumulation. However, the 150 kg $K_2O$ ha$^{-1}$ treatment did not consistently produce better results than 100 kg $K_2O$ ha$^{-1}$, indicating that 100 kg $K_2O$ ha$^{-1}$ was sufficient under the present soil and environmental conditions. Similar findings have emphasized the importance of nutrient availability and soil fertility improvement in supporting crop productivity (Johnson et al., 2022; Beerling et al., 2024).

Leaf pruning did not significantly affect plant height, stem diameter, or flowering time, but it did significantly improve ear weight and ear length at mild to moderate levels. This suggests that pruning mainly affected canopy structure and assimilate distribution rather than early vegetative growth. Moderate pruning may reduce shading from older lower leaves and improve light interception, while excessive pruning can reduce photosynthetic leaf area and limit carbohydrate supply to developing ears. Therefore, the increase in ear weight and ear length under 1–3 leaf pruning reflects a better source–sink balance in the plant (Ainsworth and Long, 2021; Velumani et al., 2021).

The interaction between potassium dose and pruning was most evident in ear weight, ear diameter, and sweetness content. The highest ear weight was obtained from 100 kg $K_2O$ ha$^{-1}$ combined with 1-leaf pruning, indicating that moderate potassium supply and mild canopy reduction created favorable conditions for assimilate production and translocation to the ears. Sweetness content also increased with potassium application, which may be related to K's role in sugar formation and carbohydrate transport. These results show that yield and quality improvement depend not only on fertilizer dose, but also on the efficiency of canopy management and assimilate allocation (Johnson et al., 2022; Yang et al., 2024).

Harvest index was not significantly affected by potassium dose, pruning, or their interaction, indicating that biomass partitioning to economic yield remained relatively stable across treatments. This may be due to low initial soil fertility, limited nutrient availability, or environmental factors that restricted the full expression of treatment effects (Beerling et al., 2024; Farah et al., 2025).

## 5. Conclusions

This study demonstrated that potassium fertilization and leaf pruning improved sweet corn performance through complementary effects on growth, yield, and quality. The application of 100 kg $K_2O$ $ha^{-1}$ was the most favorable potassium dose, while pruning 1–3 lower leaves improved ear development. The interaction between potassium dose and pruning showed that sweet corn productivity was not determined solely by fertilizer input, but by the balance between nutrient availability and canopy management. Therefore, 100 kg $K_2O$ $ha^{-1}$, combined with moderate leaf pruning, is recommended as an effective agronomic strategy to enhance sweet corn yield and quality. Further studies under different environmental conditions are needed to confirm this recommendation.

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**Conflicts of Interest:** The authors declare no conflicts of interest.

## References

Ainsworth, E. A., and Long, S. P. (2021). 30 years of free-air carbon dioxide enrichment (FACE): What have we learned about future crop productivity and its potential for adaptation? Global Change Biology, 27(1), 27-49. https://doi.org/10.1111/gcb.15375

Baranowska, A. (2023). The nutritional value and health benefits of sweet corn kernels (*Zea mays* ssp. saccharata). Health Problems of Civilization, 17(4), 408–416. https://doi.org/10.5114/hpc.2023.133364

Beerling, D. J., Epihov, D. Z., Kantola, I. B., Masters, M. D., Reershemius, T. and Planavsky, N. J. (2024). Enhanced weathering in the U.S. Corn Belt delivers carbon removal with agronomic benefits. Proceedings of the National Academy of Sciences, 121. https://doi.org/10.1073/pnas.2319436121

Coello, F., Decorte, T., Janssens, I., Mortier, S., Sardans, J., Peñuelas, J., and Verdonck, T. (2024). Global crop-specific fertilization dataset from 1961–2019. 12(1), 40. https://doi.org/10.48550/arXiv.2406.10001

Deng, T., Wang, J. H., Gao, Z., Shen, S., Liang, X. G., Zhao, X., Chen, X. M., Wu, G., Wang, X., and Zhou, S. L. (2023). Late split-application with reduced nitrogen fertilizer increases yield by mediating source–sink relations during the grain filling stage in summer maize. Plants, 12(3), 625. https://doi.org/10.3390/plants12030625.

Duan, M., Zhang, X., Wei, Z., Chen, X., and Zhang, B. (2024). Effect of maize canopy structure on light interception and radiation use efficiency at different canopy layers. Agronomy, 14(7), 1511. https://doi.org/10.3390/agronomy14071511.

Fan, Y. F., Gao, J. L., Sun, J. Y., Liu, J. Su, Z. J., Hu, S. P., Wang, Z. G., and Yu, X. F. (2022). Potentials of straw return and potassium supply on maize (*Zea mays* L.) photosynthesis, dry matter accumulation and yield. Scientific Reports, 12(1), 799. https://doi.org/10.1038/s41598-021-04508-w.

Farah, A. A., Mohamed, M. A., Musse, O. S., and Nor, B. A. (2025). The multifaceted impact of climate change on agricultural productivity: A systematic literature review of SCOPUS-indexed studies (2015–2024). Discover Sustainability, 6(1), 397. https://doi.org/10.1007/s43621-025-01229-2

Hu, T., Zhang, X., Khanal, S., Wilson, R., and Leng, G. (2024). Climate change impacts on crop yields: A review of empirical findings, statistical crop models, and machine learning methods. Environmental Modelling & Software. https://doi.org/10.1016/j.envsoft.2024.106119

Jägermeyr, J., Müller, C., Ruane, A. C., Elliott, J., Balkovic, J. and Castillo, O. (2021). Climate impacts on global agriculture emerge earlier in new generation of climate and crop models. Nature Food, 2(11), 873–885. https://doi.org/10.1038/s43016-021-00400-y

Johnson, R., Vishwakarma, K., Hossen, M. S., Kumar, V. and Shackira, A. M. (2022). Potassium in plants: Growth regulation, signaling, and environmental stress tolerance. Plant Physiology and Biochemistry, 172, 56–69. https://doi.org/10.1016/j.plaphy.2022.01.001

Tashiro, K., Ishitani, M., Murai, S., Niimi, M., Tobisa, M., Idota, S. and Ishii, Y. (2024). Effect of defoliation on growth, yield and forage quality in maize, as a simulation of the impact of fall armyworm (*Spodoptera frugiperda*). Agri Engineering, 6(2), 1847–1858. https://doi.org/10.3390/agriengineering6020107.

Ledenčan, T., Horvat, D., Špoljarić Marković, S., Svečnjak, Z., Jambrović, A., and Šimić, D. (2022). Effect of harvest date on kernel quality and antioxidant activity in su1 sweet corn genotypes. Agronomy, 12(5), 1224. https://doi.org/10.3390/agronomy12051224.

Shah, I. H., Wu, J., Li, X., Hameed, M. K., Manzoor, M. A., Li, P., Zhang, Y., Niu, Q., and Chang, L. (2024). Exploring the role of nitrogen and potassium in photosynthesis implications for sugar: Accumulation and translocation in horticultural crops. Scientia Horticulturae, 327, 112832. https://doi.org/10.1016/j.scienta.2023.112832.

Sidahmed, H., Vad, A., and Nagy, J. (2025). Advances in sweet corn (*Zea mays* L. saccharata) research from 2010 to 2025: Genetics, agronomy, and sustainable production. Agronomy, 15(5), 1260. https://doi.org/10.3390/agronomy15051260.

Velumani, K., Lopez-Lozano, R., Madec, S., Guo, W., Gillet, J., Comar, A., and Baret, F. (2021). Estimates of maize plant density from UAV RGB images using Faster-RCNN detection model: Impact of the spatial resolution. ISPRS Journal of Photogrammetry and Remote Sensing, 176, 39–51. https://doi.org/10.34133/2021/9824843

Yang, Y., Tilman, D., Jin, Z., Smith, P., and Barrett, C. B. (2024). Climate change exacerbates the environmental impacts of agriculture. Science, 385(6713). https://doi.org/10.1126/science.adn3747

Yuan, X., Li, S., Chen, J., Yu, H., and Yang, T. (2024). Impacts of global climate change on agricultural production: A comprehensive review. Agronomy, 14(7), 1369. https://doi.org/10.3390/agronomy14071369