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Morpho-Physiological Response of Sweet Corn (*Zea mays* L. Var saccharata Sturt) Bonanza F1 Variety to Drought Stress and Potassium Fertilizer Application

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Abstract

Sweet corn (*Zea mays* L. Var saccharata Sturt) has a high demand in Indonesia, but its productivity is threatened by drought; therefore, it is necessary to analyze its growth under drought stress conditions. This study aims to observe the morphological and physiological responses of sweet corn plants to drought stress and potassium administration. The research was conducted over a three-month period at the experimental garden of the Faculty of Agriculture, University of Riau. A Factorial Completely Randomized Design (RA LF) was used with two factors: drought stress and potassium fertilization. The study consisted of three levels of potassium fertilization, with three replications, resulting in a total of 18 experimental units. The first factor: A1 = everyday; A2 = drought stress. The second factor: K 1 = 2.3 g K 2 O plant -1; K 2 = 2.8 g K 2 O plant -1; K 3 = 180 kg K 2 O ha -1. Analysis of Variance was continued with the Honestly Significant Difference (HSD) test at 5% level. The observed parameters consisted of physiological and morphological factors in sweet corn plants. The study found that drought stress negatively impacted the physiological parameters of sweet corn, including reduced plant water content and increased proline levels. Additionally, drought stress decreased key morphological traits, including plant height, root condition, cob husk weight, cob husk length, and cob husk diameter. However, the application of potassium fertilizer, particularly at a dose of 3.4 g K_2O plant-1, significantly improved the length of the cob husk. Overall, increasing potassium application under drought stress conditions tended to enhance both morphological and physiological parameters of sweet corn.

Keywords: Drought Stress, K Fertilizer, Plant Growth, Sweet Corn Plants, Yield Components

1. Introduction

Sweet corn (*Zea mays* L. Var saccharata Sturt) is in high demand in Indonesia, primarily for direct consumption, whether boiled or roasted, or as a raw material for industry and animal feed (Agustiar et al., 2017; Gribaldi, 2012; Kusrini & Suharyani, 2024; Ramadhan et al., 2022). Despite this, the productivity of sweet corn in Indonesia remains relatively low, averaging around 8.31 tons per hectare, compared to its potential yield of 14-18 tons per hectare (Gribaldi, 2012). This low productivity can be attributed to factors such as declining soil fertility and the shrinking of agricultural land. Therefore, increasing production, especially on marginal lands like swamps and ultisols, has become a priority (Kusrini & Suharyani, 2024). Moreover, the high demand for sweet corn, coupled with insufficient national production, has led to an import deficit, with imports expected to reach 1.3 million tons by 2024 (BPS, 2024).

A significant challenge for sweet corn cultivation today is climate change, which has led to more frequent and intense droughts, particularly in marginal agricultural areas and during extended dry seasons (Y. Ali et al., 2022; Laskari et al., 2022). Drought stress affects the physiological balance of plants by reducing water availability, causing stomata closure, reducing photosynthesis rates, and disrupting seed and cob

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formation. At the physiological level, drought stress initiates a cascade of responses, including photosystem II dysregulation, marked by a decrease in the Fv/Fm ratio from 0.83 to 0.48 and the accumulation of reactive oxygen species (Zandalinas et al., 2018). Studies in the Mediterranean have shown that moderate water stress reduces carbon assimilation by 41%, while severe stress reduces silage yield by 54% in corn plants (Laskari et al., 2022). Furthermore, the critical tasseling-silking phase can be significantly impacted by drought, leading to a reduction in pollen viability (from 67.65% to 40.29%) and desynchronization of the pollination process (Sheoran et al., 2022). Post-harvest, drought exacerbates the conversion of sugar to starch, reducing the market quality of sweet corn by up to 30% (Mushtaq et al., 2025). This issue becomes especially pronounced in areas with limited post-harvest infrastructure.

Integrated mitigation strategies are imperative solutions, with potassium nutrition playing a central role as a physiological master regulator. Recent research has revealed a dual mechanism of potassium through the activation of the enzyme sucrose synthase, which stabilizes osmotic pressure (S. Liu & Qin, 2021) and modulates organic root exudates, thereby increasing soil nutrient availability (Sheoran et al., 2022). At the field level, integration with a liquid organic fertilizer mixture of Kirinyuh leaves and banana peels showed a positive synergy (Ramadhan et al., 2022). Adjusting the planting distance to 80 × cm was shown to increase water use efficiency by up to 40% (Rehana et al., 2017). This innovation is reinforced by findings from Zimbabwe, which have proven that the adoption of drought-resistant varieties can increase yields by 617 kg/ha while saving production costs of $240 per hectare (Lunduka et al., 2019). Sweet corn farmers in Riau face multidimensional obstacles in adopting this technology, including imprecise fertilizer doses and limited soil moisture monitoring tools (Sinaga et al., 2023). Field research in Aceh showed that a combination of inorganic and liquid organic fertilizers produced an optimal response in the Bonanza F1 variety (Ramadhan et al., 2022), while a study in South Africa proved that adjusting the planting time to November-December could reduce the risk of crop failure by up to 25% (Ferreira et al., 2023). However, the implementation of this technique is still hindered by the lack of specific data on the interaction between potassium and drought stress in Ultisol soil conditions that predominate in Sumatra.

Based on the complexity of the challenges, this study employed an experimental approach using a two-factorial Completely Randomized Design to answer critical questions. The first factor applied a gradient of water stress from normal conditions to a deficit of 60% of field capacity initiated since 15 Days After Planting (Dato et al., 2023). The second factor tested the precise potassium dose at levels of 120, 150, and 180 kg K_2O per hectare (Dato et al., 2023). Three strict replications were applied to ensure statistical validity in quantifying several key aspects: the performance of the sucrose synthase enzyme as a marker of osmotic resistance (S. Liu & Qin, 2021), the profile of organic root exudates that affect nutrient availability (Sheoran et al., 2022), and the accuracy of the evapotranspiration partition model in predicting location-specific water needs (Gardiol et al., 2003). Practically, this study is expected to produce an integrated technology package combining 150 kg/ha of potassium with 500 ml/L of liquid organic fertilizer that has been proven effective in Aceh (Ramadhan et al., 2022). An adaptive deficit irrigation protocol tailored to critical growth phases will be developed to inform farmers' decision-making (Ferreira et al., 2023). The discovery of the phenylalanine ammonia-lyase enzyme as a marker of cell membrane resistance opens up opportunities for the development of superior varieties in the future (A. E. E. Ali et al., 2023). Implementation in Riau farmers' fields is projected to increase water use efficiency by up to 35% and net income by 28.5% through a 22% reduction in post-harvest losses (Mushtaq et al., 2025), while building the resilience of a sustainable sweet corn production system amidst climate uncertainty.

This research serves as a strategic foundation to connect laboratory experimental results with field practices of sweet corn cultivation in Indonesia, especially in facing the challenges of drought, by validating the plant water partition model and testing an integrated technology package, including water-saving irrigation techniques, the use of organic mulch, and the selection of stress-resistant hybrids, so that it is expected to obtain guidelines for the implementation of adaptive and sustainable precision agriculture for farmers as well as policy recommendations to increase the resilience and productivity of sweet corn on marginal land.

2. Material and Methods

This research was conducted over three months at the Experimental Garden of the Faculty of Agriculture, University of Riau, located at coordinates 0.47873° N and 101.37833° E, with an altitude of approximately 800 meters above sea level. The ingredients consisted of sweet corn seeds of the Bonanza F1 variety, manure, Urea fertilizer, TSP, and KCl, Furadan 3G, Decis 25 EC, Ridomil Gold MZ 4/64 WG, and Demorf 60 WP. The tools include a chlorophyll meter, LI-COR LI-6400XT Portable Photosynthesis System, a 50 cm x 40 cm polybag, a 5 mm sieve, a digital scale, a caliper, a measuring cup, a hoe, a machete, a meter, scissors, a watering can, and stationery.

The study employed a completely randomized design (CRD) with two factors: drought stress and K fertilizer, with three replications, resulting in 18 experimental units. The first factor included everyday and drought stress; A2 =

drought stress. The second factor: administration of K at a dose of 2.3 g K2O plant-1, 2.8 g K2O plant-1, and 3.4g K2O plant-1. The data obtained were analyzed statistically using Analysis of Variance, followed by the Honestly Significant Difference (HSD) test at the 5% level, if the results were significant. Data analysis was performed using the SAS 9.1 program. The research flow can be seen in the following diagram:

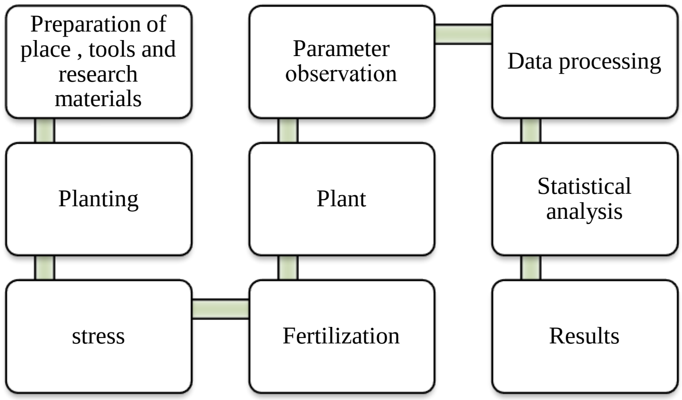

Figure 1. Research flow diagram

3. Results and Discussion

3.1. Environmental Factors

3.1.1. Soil Water Content

A decrease in soil water content characterizes the condition of drought stress. The results of soil water content measurements are presented in Figure 2. Figure 2 shows that the soil water content in sweet corn plants experiencing drought stress is lower than in normal conditions. The soil water content in normal conditions ranges from 21% to 28%, while the soil water content during drought stress ranges from 12% to 20%.

Soil water content measurements are carried out every day after 1 day of watering, using the gravimetric method, namely by taking soil samples of approximately 4-8 g. Changes in Soil moisture content are calculated using the formula:

$$\mathbf{TLC} = \frac{\mathbf{BB-BK}}{\mathbf{BB}} \mathbf{\ x\ 100\%}$$

where BB=weight of treated soil and BK=weight of oven-dry soil

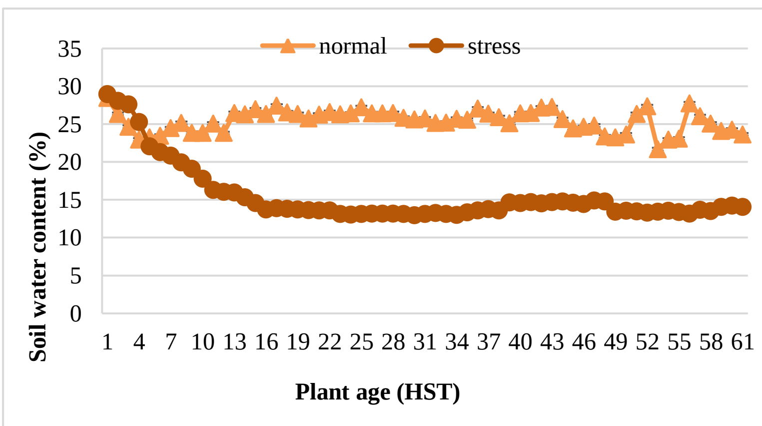

Figure 2. The condition of soil water content during the plant growth process

After the plants as a whole (under stress treatment) have shown symptoms of wilting and the soil survey tool has indicated dryness (+), 200 ml of water is added to each treatment to maintain the life of the sweet corn plants until harvest. This treatment was conducted continuously to ensure the plants experienced continuous stress.

3.1.2. Soil Temperature

The results of the soil temperature measurements are presented in Figure 3. Figure 3 shows that, in general, the soil temperature in plants experiencing drought stress is higher than in normal conditions. The provision of K to sweet corn plants did not differ significantly between treatments, but it tended to decrease soil temperature when the provision of K was increased.

Soil water content and soil temperature are 2 determining factors in the growth and development of sweet corn plants. In drought-stress conditions, soil water content decreases drastically, while soil temperature increases. Moreover, the soil conditions in sweet corn plantations look drier. The results of the study showed that in the topsoil 0-25 cm, there is a close relationship between soil water content and soil temperature. The lower the soil water content, the higher the soil temperature, as its thermal conductivity decreases, resulting in the soil losing its ability to distribute heat to deeper layers (Al-Shammary et al., 2025). In this study, polybags with a small layer of soil were used. So that the soil becomes easier to dry. Dry soil also triggers a decrease in soil thermal conductivity.

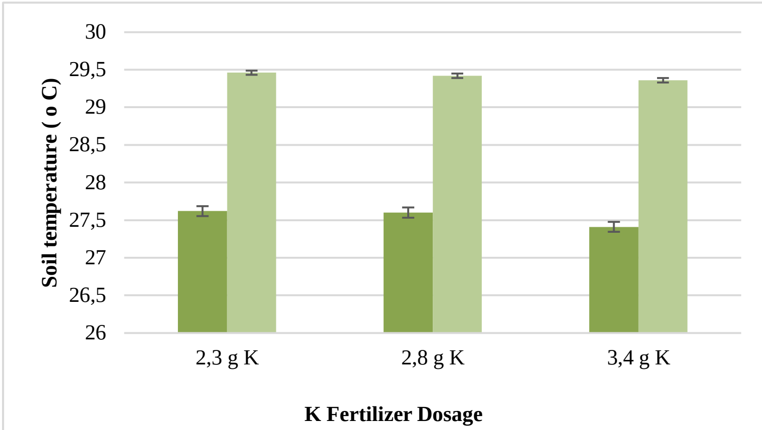

Figure 3. Soil temperature conditions (normal/left and drought stress/right) during the plant growth process

Soil thermal conductivity (λ) is the ability of soil to conduct heat per unit temperature and distance. This value is greatly influenced by soil water content and density. Dry soil has high porosity, which contains air spaces, resulting in a very low λ value. This value is generally less than 0.25 W m^{-1} K^{-1}, while wet or moist soil can reach 1–1.5 W m^{-1} K^{-1} (Al-Shammary et al., 2025). Furthermore, the study results (Fu et al., 2024) indicate that when the soil loses water, the pore space is filled with air, becoming a heat insulator that traps solar radiation on the surface and prevents heat from penetrating the inner layer. This setting forms a steep temperature gradient between the surface (very hot) and the lower layer (colder). The increase in surface temperature is up to 7–10 °C when the water content is <10%. Thus, a decrease in thermal conductivity creates an insulating effect that causes heat accumulation on the surface, disrupts the physio-microclimatic conditions of the roots, and significantly reduces the ability of plants to absorb water and nutrients (M. Liu et al., 2024).

3.2. Physiological Factors

3.2.1. Proline Content

The results of measuring proline content in sweet corn plants are shown in Figure 4. Figure 4 shows that there is a difference in proline content between normal plants and stressed plants, or those experiencing drought stress. There is an increase in proline content in plants experiencing drought stress. Proline is one of the amino acids formed in plants that are stressed due to drought stress. As a physiological response, plants accumulate proline, which acts as an osmoprotectant and antioxidant, helping them overcome drought stress (Khan et al., 2025). Furthermore, Proline functions as a compatible osmolyte, helping to reduce the water potential of cells, maintain turgor pressure, and prevent cells from shrinking when water is limited (Weisany et al., 2023). High Proline content is an adaptive response of plants to drought, as it can maintain turgor, stabilize membranes and proteins, and suppress oxidative stress (Sanusi et al., 2025).

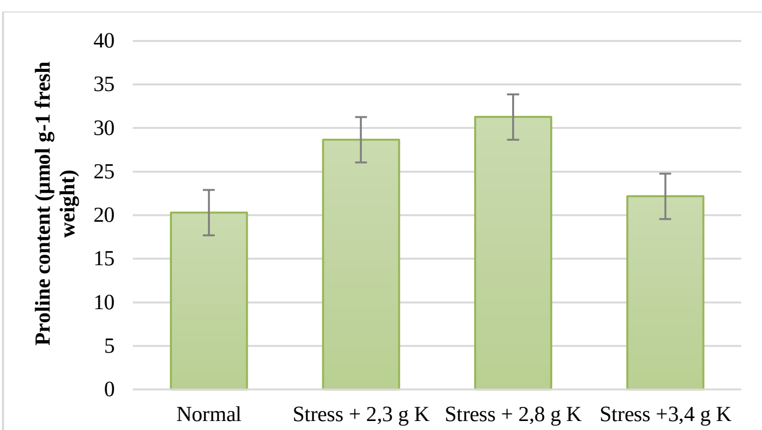

Figure 4. Proline content of sweet corn plants

The highest proline content was found in the provision of 2.8 g K2O per plant-1 of 31.27 µmol g-1 fresh weight. If the provision of K is increased, the proline content decreases. This result is related to the role of K in increasing cell turgor, so that plants no longer "feel" water stress. When the stress signal weakens, it causes a decrease in proline synthesis (Wasaya et al., 2021). It was previously reported that the administration of potassium at an optimal dose reduced proline levels, not as a sign of plant damage but physiological recovery, and the combination of biochar with potassium reduced corn proline by 22-30% through increased turgor, water potential (Ψ), and antioxidant enzyme activity (Rahman et al., 2025). In contrast, this study recorded an increase in corn proline levels of up to 29.10%, indicating a stronger response to drought stress.

3.2.2. Plant Water Content

The results of measuring the water content in sweet corn plants are shown in Figure 5. Figure 5 shows that the water content of sweet corn plants under drought stress is lower than that of plants under normal conditions. Plant water content or Relative Water Content (RWC) is the percentage of water contained in plant tissue, and this reflects the hydration status and water balance in plant cells. This parameter is crucial as an indicator of one of the plant's responses to drought stress, especially in plants such as sweet corn, which are highly sensitive to water shortages (Lestari et al., 2020).

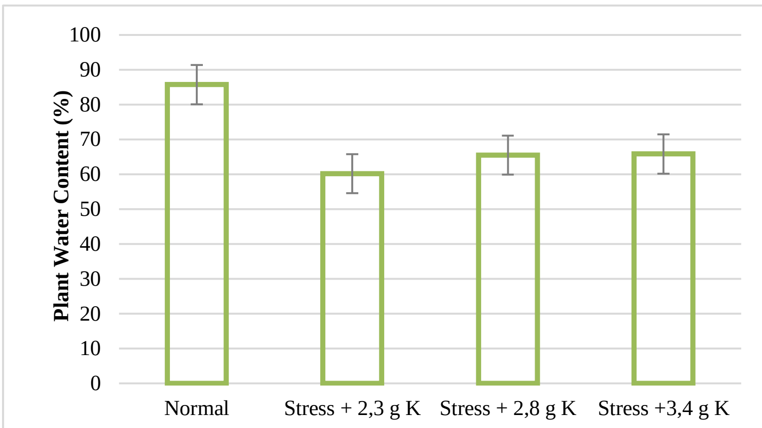

Figure 5. Plant water content

Giving K with a higher dose tends to increase the water content of plants. Increasing the dose of 2.8g K2O plant-1 can increase the water content of plants by 8.86% compared to giving 2.3g K2O plant-1. Potassium is one of the essential fertilizers that plays a physiological role in plant water uptake (Yang et al., 2024). Furthermore, Potassium also plays a role in the capacity to store water, the process of closing and opening stomata, helping to take CO2, the formation of starch and protein, root growth and development, strengthening plants so that they do not fall off easily and can increase plant resistance to pests and diseases (Fahri & Khairani, 2023).

3.3. Morphological Factors

3.3.1. Plant Height

The results of measuring the height of sweet corn plants are shown in Figure 6. Figure 6 shows that the growth of sweet corn plants experiencing drought stress is shorter than that of normal plants. The leaves of plants experiencing drought stress are smaller and shorter, and appear wilted, compared to those of plants that are not stressed. Plants experiencing drought stress produce an average of 3 cobs per plant, but these cobs are smaller than those of normal plants, which produce 1 cob per plant.

Figure 6. Comparison of sweet corn plant height under normal and stress conditions, and with the addition of K.

3.3.2. Plant Roots

The results of documenting sweet corn root cross-sections under normal and stress conditions are shown in Figure 7. Figure 7 illustrates that the root length of plants experiencing drought stress is shorter and smaller than that of normal plants. The root length of normal plants reaches 90 cm, while the root length of stressed plants is only 80 cm. The roots of normal plants also appear more numerous and have a larger volume.

Drought stress has a significant impact on the morphology of sweet corn plants in terms of plant height and root cross-section. This result indicates that water stress inhibits the vegetative growth process in both the upper (crown) and lower (root) parts, as a physiological response of plants to limited water availability (Farooq et al., 2009). Drought stress in this study has been found to reduce the average root volume by 71.58%. Meanwhile, in previous studies, it was found that the average decrease in root volume was 71.70% or 131.62 mL due to drought stress.

Figure 7. Cross-section of sweet corn plant roots under normal and water stress conditions.

Plant height reduction can occur due to reduced cell division and elongation activity, which is triggered by weakened turgor pressure in meristem tissue. In water-stress conditions, limited water availability results in decreased internal cell pressure, thereby disrupting the cell expansion process and slowing plant growth(Zhou et al., 2023).

In addition, roots that develop with shorter sizes and small volumes reflect the limited capacity of plants to reach water and nutrients in the soil. Roots that do not grow optimally contribute to low water absorption efficiency, thus further worsening the physiological status of plants in drought conditions.

Furthermore, drought stress also causes a redistribution of plant biomass, with priority given to resource allocation to support vital organ structures for survival, such as primary roots, while the growth of lateral roots and other vegetative tissues is reduced. The consequence is a decrease in the total volume of the root system and the surface area of water absorption, which ultimately inhibits overall plant growth (Tardieu et al., 2018).

3.3.3. Weight of Cob with Cob

The results of the analysis of variance showed that drought stress had a significant effect on the weight of sweet corn cobs. The provision of K, as well as the interaction between drought stress and K provision, had no significant effect on the weight of sweet corn cobs. The results of the 5% BNJ further test are presented in Table 1. Table 1 shows that the weight of the cob of sweet corn plants experiencing drought stress is lower than that of normal plants. The decrease in cob weight was 76.69% or 138.42 g due to drought stress. The treatment of K fertilizer showed no significant difference in the weight of the cob of sweet corn plants. The interaction between drought stress and K fertilizer administration did not result in a significant difference in the weight of the sweet corn cob.

3.3.4. Length of Corn Cob

The results of the analysis of variance showed that drought stress had a significant effect on the length of the sweet corn cob. K administration significantly affected the length of the sweet corn cob. The interaction between drought stress and K administration did not significantly affect the length of the sweet corn cob. The results of the 5% BNJ further test are presented in Table 2.

Table 1. Weight of sweet corn cobs (g) under drought stress and K fertilizer application.

Treatment	K fertilizer (g K_2O plant^{-1})			Average
	2.3	2.8	3.4	
Normal	171.92 ± 2.58 a	184.50 ± 2.77 a	185.00 ± 2.70 a	180.47 ± 2.68 a
Drought stress	47.17 ± 0.94 a	42.19 ± 0.84 a	36.80 ± 0.74 a	42.05 ± 0.84 b
Average	109.54 ± 1.76 a	113.35 ± 1.93 a	110.90 ± 1.83 a	

Numbers followed by the same lowercase letter in the same column and row indicate no significant difference according to the BNJ test at the 5% level.

Table 2. Length of cob with husk (cm) of sweet corn plants under drought stress and K application

Treatment	K fertilizer (g K_2O plant $^{-1}$)			Average
	2.3	2.8	3.4	
Normal	27.74 ± 0.56 a	26.66 ± 0.53 a	27.11 ± 0.54 a	27.17 ± 0.54 a
Drought stress	18.67 ± 0.37 a	16.92 ± 0.34 a	17.72 ± 0.35 a	17.77 ± 0.36 b
Average	23.21 ± 0.46 a	21.79 ± 0.44 b	22.41 ± 0.45 ab	

Numbers followed by the same lowercase letter in the same column and row indicate no significant difference according to the 5% BNJ test.

Table 2 shows that the length of the cob of sweet corn plants experiencing drought stress is lower than that of normal plants. The decrease in the length of the cob of cob was 34.59% or 9.4 cm due to drought stress. The K treatment showed a significant difference in the length of the cob of sweet corn plants. The interaction between drought stress and K fertilizer administration also showed no significant difference in the length of the sweet corn plants' cobs.

3.3.5. Diameter of the Cob with the Cob

The results of the analysis of variance showed that drought stress significantly affected the diameter of the cob with husk. K administration and the interaction between stress and K administration had no significant effect on the diameter of the cob with husk of sweet corn plants. The results of the 5% BNJ further test are presented in Table 3.

Table 3. Diameter of cob with husk (mm) of sweet corn plants under drought stress and K fertilizer application

Treatment	K fertilizer (g $_{K2O}$ plant $^{-1}$)			Average
	2.3	2.8	3.4	
Normal	45.40 ± 0.91 a	46.81 ± 0.94 a	47.21 ± 0.94 a	46.47 ± 0.93 a
Drought stress	30.11 ± 0.60 a	27.50 ± 0.55 a	29.43 ± 0.59 a	29.01 ± 0.58 b
Average	37.75 ± 0.76 a	37.15 ± 0.74 a	38.32 ± 0.77 a	

Numbers followed by the same lowercase letter in the same column and row indicate no significant difference according to the BNJ test at the 5% level.

Table 3 shows that the diameter of the cob of sweet corn plants experiencing drought stress is lower than that of normal plants. The decrease in the diameter of the cob of cob was 37.57% or 17.46 mm due to drought stress.

The treatment of K fertilizer showed no significant difference in the diameter of the sweet corn cob. The interaction between drought stress and K fertilizer administration also gave no significant difference in the diameter of the sweet corn cob.

Sweet corn plants (*Zea mays* saccharata) that experience drought stress exhibit a significant decrease in the morphological parameters of sweet corn plant yields, including the weight of the cob husk, the length of the cob husk, and the diameter of the cob husk. Plants grown under water deficit conditions experienced a significant decrease in these three parameters compared to plants grown under normal conditions without water stress. This point aligns with previous findings that water shortages during the generative growth phase of corn plants disrupt the seed filling and cob formation processes, resulting in a quantitative decrease in yield (GEA, 2021).

Potassium (K) application at various doses under drought stress conditions showed a limited effect on yield increase. Of the three morphological parameters of the cob observed, only the length of the cob showed a positive response to potassium application. Meanwhile, the weight and diameter of the cob did not show a significant increase. This finding suggests that the role of potassium under water stress conditions is more pronounced in terms of cell elongation, which may contribute to the increase in cob length, but has not been able to optimize overall grain filling (Syauqi & Amzeri, 2023).

Physiologically, potassium plays a crucial role in maintaining turgor pressure, regulating stomatal opening, and enhancing water use efficiency in plants, particularly under abiotic stress conditions such as drought. However, the effectiveness of potassium in maintaining sweet corn productivity under drought stress is highly dependent on the intensity of water stress and the timing of its administration. Therefore, appropriate fertilization strategies and effective irrigation management remain the primary factors in maintaining sweet corn yields in drought-prone areas (Hasanuzzaman et al., 2018).

The results of this study indicate that sweet corn plants experiencing drought stress produce small cobs, with a diameter of no more than 3 cm, and typically form 2 to 3 cobs per plant. This phenomenon aligns with the findings in the literature review, which mentions an abnormality in cob development known as multi-ears per node, characterized by the emergence of several cobs from a single growing point. This condition generally occurs due to environmental stress, especially drought experienced by plants after the cob initiation phase (stage V4–V6 until near pollination). At this stage, physiological disorders due to lack of water can cause the formation of small secondary cobs, due to the limited allocation of plant resources such as water, photosynthates, and growth hormones that should be focused on the development of the main cob (Ortez et al., 2022; Rou et al., 2020). This point supports the finding that plants under water stress conditions can produce more than one cob as reproductive compensation, but with a much smaller size (Kerawing et al., 2024)

This result is due to drought stress triggering metabolic changes in plants, disrupting growth hormone balance, genetic influences, and variety adaptation, which encourage plants to divert their resources to maintain reproductive sustainability (Luo et al., 2023). One of the things that is done is the formation of more generative organs (cobs), although they are smaller in size due to limited water and nutrient intake. This form of defense is known as an escape and survival strategy (Kooyers, 2015). Comparative documentation of cobs with husks experiencing drought stress versus normal ones is shown in Figure 8.

Figure 8. Comparison of sweet corn cobs under normal conditions, drought stress, and K addition.

Figure 8 shows that the cobs with husks that experience drought stress are smaller and shorter than normal plants. The cobs produced by plants due to drought stress are more than those of normal plants. The provision of K has not yielded different results in the formation of cobs, including their length, diameter, and weight, with husks, in both normal and stressed plants.

3.4. Correlation Data

Table 4 presents the correlation values between various observation parameters, both positive and negative. This correlation value represents the level of relationship between parameters. A positive correlation indicates that an increase follows an increase in another parameter. Conversely, a negative correlation indicates that an increase in one parameter is inversely proportional to another parameter. The weight of the cob with husk shows a powerful positive correlation with soil water content (r = 0.895). This relationship highlights the close connection between environmental factors, particularly groundwater availability, and the yield of sweet corn plants. Increasing soil water content contributes directly to increasing the weight of the cob with husk, and vice versa.

Table 4. Correlation Data Between Parameters

	KP	PTB	DTB	BTB
KAT	0.841 **	0.865 **	0.895 **	0.895 **
KP		0.924 **	0.952 **	0.952 **
PTB			0.952 **	0.952 **
DTB				1,000 **

Description: KAT = Soil Water Content, KP = Proline content, PTB = Length of cob with husk, DTB = Diameter of cob with husk, BTB = weight of cob with husk. If the correlation value: KK = 0: No correlation, KK = >0.000-0.199: Very weak correlation, KK = >0.200-0.399: Weak correlation, KK = >0.400-0.599: Moderate correlation, KK = >0.600-0.799: Strong correlation, KK = >0.800-1.000: Very strong correlation. * = significant at 5% test level, ** = significant at 1% test level.

In addition, the weight of the cob with husk also correlates very strongly with several morphological and physiological parameters of the plant, including the diameter of the cob with a correlation value (r = 1,000), the length of the cob with husk (r = 0.952), and the proline content (r = 0.927). This result indicates that the more optimal the plant's growth and physiological response, the greater the harvest obtained.

In general, the correlation between the weight of the cob and physiological and morphological parameters of the plant shows a very close relationship. In other words, an increase in these parameters will be accompanied by an increase in the weight of the cob, making these parameters important indicators for assessing plant performance against environmental conditions.

4. Conclusion

Based on the results of the research conducted, it can be concluded that drought stress increases proline content while decreasing plant water content. Drought stress negatively impacts various morphological parameters, including plant height, root cross-section, cob length, cob diameter, and cob weight. The application of potassium (K) fertilizer is effective in increasing cob length. Furthermore, increasing potassium application under drought stress conditions tends to enhance morpho-physiological parameters. Therefore, administering potassium during drought stress can help sustain the vitality of sweet corn plants.

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