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Assessment of yield performance of sweet corn hybrids under natural condition (organic management) in Meghalaya

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ABSTRACT:

Maize (*Zea mays* L.), often referred to as the "Queen of the Cereals," is renowned for its high productivity and diverse uses. This study evaluates the yield performance of six sweet corn hybrids (*Zea mays* var. *saccharata*) under organic management conditions in Meghalaya. Sweet corn, characterized by its high sucrose content and harvested at the milking stage, offers significant economic and nutritional benefits. The phenotypic traits assessed include Days of Anthesis (DA), Days of Silking (DS), Plant Height (PH), Ear Height (EH), Cob Count (CC) per plot, Cob Weight with Husk (CWH) per plot, and Cob Weight without Husk (CWWH) per plot. The trial, conducted during the kharif season of 2022, used a Randomized Block Design (RBD) with three replications. Results indicated that the hybrid variety Sugar 75 exhibited the highest yield (CWH: 8.8 kg, CWWH: 7.6 kg) and performed best overall, followed by the hybrid Shalini.A correlation analysis revealed significant relationships between various yield-related traits, providing insights into trait interactions and their combined impact on yield performance. The findings suggest that the adoption of suitable

sweet corn hybrids can enhance production and productivity under organic conditions in Meghalaya, providing valuable insights for local farmers and stakeholders.

KEYWORDS: Sweet corn hybrids, organic management, yield performance, Meghalaya

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INTRODUCTION:

Maize (*Zea mays* L.), commonly known as "Queen of the Cereals," is the third most important cereal crop globally, following rice and wheat (Kaushal et al., 2023). Renowned for its high productivity and versatility, maize is a vital staple in many countries, including India. India ranks as the seventh-largest producer of maize worldwide, with an annual production of 28.75 million metric tons from an area of 9.38 million hectares (IndiaAgristat, 2020). The average productivity of maize in India is over 3 tons per hectare, reflecting its significant role in the agricultural sector.

Maize exhibits considerable diversity in kernel morphology (Al-Naggar et al., 2020), biochemical composition (Wen et al., 2016), and harvesting time (Romero Navarro et al., 2017), resulting in various types such as flour corn (Zea mays var. amylacea), waxy corn (*Zea mays* var. *ceratina*), amylo-maize (*Zeamays*), quality protein maize (QPM), dent corn (Zea mays var. indentata), flint corn (*Zea mays* var. *indurata*), pod corn (*Zea mays* var. *tunicate*), striped maize (*Zea mays* var. *japonica*), popcorn (*Zea mays* var. *everta*), baby corn, and sweet corn (*Zea mays* var. *saccharata*). Among these, sweet corn is particularly noteworthy for its high sucrose content, harvested at the milking stage when its moisture content is approximately 70% (Revilla et al., 2021).

Sweet corn is valued not only for its fresh consumption but also for its use in various processed forms such as starch, glucose, maltose, and fructose (Kumar et al., 2019) as well as in ayurvedic medicines. Its ears, harvested early, are rich in sucrose and provide a delicious, energy-rich food source, packed with vitamins C and A. Additionally, sweet corn is consumed raw, boiled, or steamed and is a key ingredient in soups, salads, and other culinary

dishes (Swapna et al., 2020). Its green fodder also serves as an essential feed for livestock, offering additional value to farmers.

This study focuses on evaluating the yield performance of sweet corn hybrids under organic management conditions in Meghalaya. Conducted during the kharif season of 2022, this research aims to identify hybrids that perform well under natural conditions, using organic fertilizers such as farmyard manure (FYM) and poultry manure. By analyzing yield and yield-related traits, this study seeks to provide insights that can help enhance sweet corn production and productivity in the region, contributing to sustainable agricultural practices and economic growth for local farmers.

MATERIAL AND METHODS:

The present experiment was conducted during the kharif season of 2022 at a farmer's field in Bhoi-Rymbong, Ri-Bhoi District, Meghalaya, under natural conditions with organic management. Organic practices included the use of farmyard manure (FYM) and poultry manure to enhance soil fertility. Six hybrid sweet corn varieties were evaluated for their yield performance using a Randomized Block Design (RBD) with three replications.

Each experimental plot consisted of six rows, each 2 meters in length, with a plant spacing of 60 cm x 20 cm. The following phenotypic traits were recorded: Days of Anthesis (DA), Days of Silking (DS), Plant Height (PH), Ear Height (EH), Cob Count (CC) per plot, Cob Weight with Husk (CWH) per plot, and Cob Weight without Husk (CWWH) per plot. Data collection was carried out at the appropriate growth stages, ensuring accuracy and consistency across the three replications.

Statistical analysis was performed to determine the significance of differences among the hybrid varieties for each trait. Mean values were calculated for all measured traits, and comparisons were made to identify the best-performing hybrids. Additionally, a correlation analysis(Gomez & Gomez, 1984) was conducted to explore the relationships between different yield-related traits. Significant correlations were identified to provide insights into trait interactions and their combined impact on yield performance.

RESULTS AND DISCUSSION:

Mean performance

The present investigation evaluated the yield performance of six sweet corn hybrids under organic management conditions in Meghalaya. The collected data on yield and yield-related traits were subjected to statistical analysis to determine significant differences and identify the best-performing hybrids.

Table 1: Mean values and standard errors of yield-contributing traits of sweet corn hybrids

Name of Variety	DA (days)	DS (days)	PH (cm)	EH (cm)	CC	CWH (kg)	CWWH (kg)
Sugar 75	54.0 ± 0.5	57.0 ± 0.5	165.0 ± 2.0	82.7 ± 1.5	60 ± 1.0	8.8 ± 0.3	7.6 ± 0.2
RCM 1-4	56.0 ± 0.5	59.0 ± 0.5	183.3 ± 2.5	90.7 ± 1.8	57 ± 1.2	7.3 ± 0.2	5.4 ± 0.2
Shalini	58.0 ± 0.5	60.0 ± 0.5	160.0 ± 2.0	70.3 ± 1.5	55 ± 1.1	8.0 ± 0.3	6.5 ± 0.2
905 P	58.0 ± 0.5	61.3 ± 0.5	149.3 ± 2.0	55.0 ± 1.2	56 ± 1.1	7.5 ± 0.3	6.1 ± 0.2
Biosweety	60.0 ± 0.5	61.7 ± 0.5	160.0 ± 2.0	60.0 ± 1.5	54 ± 1.1	7.1 ± 0.2	5.0 ± 0.2
Sweet 77	59.0 ± 0.5	62.0 ± 0.5	165.0 ± 2.0	63.7 ± 1.5	54 ± 1.0	7.0 ± 0.2	5.1 ± 0.2

Days to Anthesis (DA) and Days to Silking (DS): The hybrid variety Sugar 75 exhibited the shortest days to anthesis (54 days) and silking (57 days), indicating early maturity. In contrast, Biosweety had the longest days to anthesis (60 days) and Sweet 77 had the longest days to silking (62 days). This variation in flowering time suggests that Sugar 75 could be more suitable for regions with a shorter growing season.

Plant Height (PH) and Ear Height (EH): RCM 1-4 recorded the tallest plants (183.3 cm), followed by Sugar 75 and Sweet 77 (165 cm each). The shortest plants were observed in 905-P (149.3 cm). Ear height followed a similar trend, with RCM 1-4 having the highest ear placement (90.7 cm), which may be advantageous for mechanical harvesting. The variety 905-P had the lowest ear height (55.0 cm), which could affect ease of harvest and potential yield.

Cob Count (CC) per Plot: Sugar 75 had the highest cob count per plot (60 cobs), significantly higher than the other hybrids, indicating its superior prolificacy. RCM 1-4 and Shalini followed with 57 and 55 cobs per plot, respectively. The lowest cob counts were observed in Biosweety and Sweet 77 (54 cobs each), suggesting lower potential yields.

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Cob Weight with Husk (CWH) and Cob Weight without Husk (CWWH): The highest cob weight with husk was recorded in Sugar 75 (8.8 kg/plot), followed by Shalini (8.0 kg/plot). Sugar 75 also had the highest cob weight without husk (7.6 kg/plot), indicating its superior overall yield. The lowest CWH was observed in Sweet 77 (7.0 kg/plot), and the lowest CWWH in Biosweety (5.0 kg/plot). The significant differences in cob weight suggest that Sugar 75 and Shalini are the most promising hybrids for high yield under organic conditions.

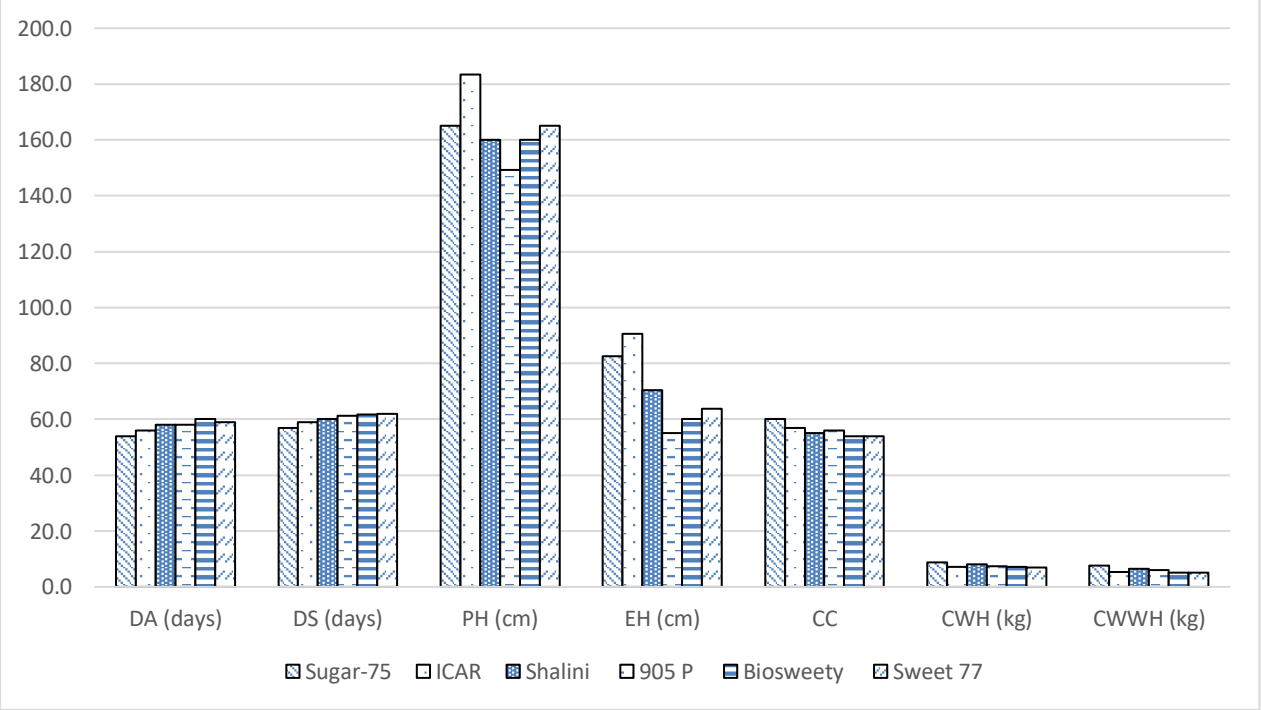

Fig.1: Graphical representation of yield and yield related traits of six hybrid varieties of sweet corn.

Correlation

The correlation matrix (Table 2) shows the relationships between different traits. Significant correlations are indicated by ** (for $r \geq 0.5$) or * (for $r < 0.5$).

	DA	DS	PH	EH	CC	CWH	CWWH

DA	1.00	0.99**	0.84**	0.62*	0.16*	-0.37*	-0.30*
DS	0.99**	1.00	0.83**	0.62*	0.13*	-0.40*	-0.32*
PH	0.84**	0.83**	1.00	0.73**	-0.10*	-0.52**	-0.51**
EH	0.62*	0.62*	0.73**	1.00	0.17*	-0.36*	-0.32*
CC	0.16*	0.13*	-0.10*	0.17*	1.00	0.56**	0.58**
CWH	-0.37*	-0.40*	-0.52**	-0.36*	0.56**	1.00	0.92**
CWWH	-0.30*	-0.32*	-0.51**	-0.32*	0.58**	0.92**	1.00

The correlation analysis of yield-related traits in sweet corn hybrids under organic management conditions revealed several significant relationships among the different traits, providing crucial insights for breeding programs. The traits Days to Anthesis (DA) and Days to Silking (DS) exhibited a highly significant positive correlation (r = 0.99**), indicating that hybrids that flower early also tend to silk early. This finding is consistent with previous studies that have shown a strong genetic correlation between flowering time and silking time in maize, highlighting the reliability of selecting for these traits simultaneously to ensure early maturity (Piekutowska et al., 2023).

Furthermore, Plant Height (PH) and Ear Height (EH) also showed a significant positive correlation (r = 0.73**), suggesting that taller plants generally have higher ear placement. This relationship is advantageous for mechanical harvesting but could increase the risk of lodging in adverse weather conditions. This positive correlation between plant height and ear height has been documented in other studies on sweet corn, indicating its importance in selecting optimal plant architecture for breeding (Kashiani & Saleh, 2010).

The traits Cob Weight with Husk (CWH) and Cob Weight without Husk (CWWH) demonstrated a very strong positive correlation (r = 0.92**), implying that selecting for heavier cobs with husk will inherently result in heavier cobs without husk. This relationship is vital for breeders aiming to improve overall yield as it suggests that efforts to increase cob weight in one form will likely translate to the other. Studies on sweet corn have similarly emphasized the importance of cob weight as a key yield determinant (Chavan et al., 2020).

Additionally, Cob Count (CC) per plot exhibited significant positive correlations with both CWH (r = 0.56**) and CWWH (r = 0.58**). This indicates that hybrids producing a higher number of cobs per plot also tend to produce heavier cobs, contributing positively to the

overall yield. The observed negative correlations between Plant Height (PH) and both CWH (r = -0.52**) and CWWH (r = -0.51**) suggest that taller plants may not necessarily produce heavier cobs. This finding points to a potential trade-off between plant height and cob weight, which breeders need to consider to avoid compromising yield potential while selecting for other desirable traits.

The findings from this correlation analysis align with previous research, emphasizing the complex interplay between different yield-related traits in sweet corn and their combined impact on overall yield performance. Breeding programs can leverage these insights to develop sweet corn hybrids with improved yield and adaptability to organic farming conditions, focusing on traits that have strong positive correlations while carefully managing the trade-offs observed in negative correlations (Piekutowska et al., 2023; Kashiani & Saleh, 2010). These findings provide a robust framework for selecting sweet corn hybrids that can enhance production under organic management in regions like Meghalaya.

CONCLUSIONS:

The evaluation of yield performance of six sweet corn hybrids under organic management conditions in Meghalaya revealed significant differences among the hybrids for various yield-related traits. The hybrid variety Sugar 75 exhibited superior performance in terms of yield, with the highest cob weight both with and without husk, as well as the highest cob count per plot. The correlation analysis provided valuable insights into the relationships between different traits, highlighting significant positive correlations between days to anthesis and silking, plant height and ear height, and cob weight with and without husk. These findings suggest that selecting for certain yield-related traits can lead to improvements in overall yield performance.

The study underscores the potential of adopting suitable sweet corn hybrids to enhance production and productivity under organic conditions in Meghalaya. By leveraging the significant correlations identified, breeding programs can focus on traits with strong positive relationships to develop hybrids with improved yield and adaptability to organic farming. The results of this study provide a robust framework for local farmers and stakeholders,

promoting sustainable agricultural practices and contributing to the economic growth of the region.

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