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INFLUENCE OF POTASSIUM SCHOENITE ON GROWTH, YIELD AND ECONOMICS OF *KHARIF* SWEET CORN IN ENTISOL

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ABSTRACT

A field experiment was initiated at the AICRP on maize farm, Zonal Agricultural Research Station Farm, Sub-montane Zone, Kolhapur, Maharashtra, India during *kharif* seasons of the year 2025, to study the influence of Potassium Schoenite on growth, yield and economics of *kharif* sweet corn in Entisol. The experiment comprised on eight treatments *viz;* Absolute control (No fertilizers); recommended dose of K_2O @ 40 kg ha^{-1} through MOP (muriate of potash); recommended dose of K_2O @ 40 kg ha^{-1} through MOP along with $MgSO_4$ and Bentonite sulphur; No recommended dose of K_2O and application of 30, 40, 50, 60 kg K_2O ha^{-1} through Potassium Schoenite in four equal splits replicated thrice and statistically tested using randomized block design. The soil of experimental plot was low in organic carbon and available nitrogen, where, available phosphorus, available potassium and available sulphur was medium in soil. Results revealed that application of four equal splits of 40 kg K_2O ha^{-1} through Potassium Schoenite recorded significantly higher growth and yield attributes *viz;* plant height (196.13cm), cob girth (18.78cm), cob length (18.53cm), number of cobs plot^{-1}(94.33), 100 dried seed weight (15.17g), weight of fresh grain cob^{-1} (221.01g), green cob yield (140.95 q ha^{-1}), and fresh stover yield (259.14 q ha^{-1}), among all other treatments. However, higher net monetary returns of Rs. 266456 ha^{-1} were fetched under application of four equal splits of 40 kg K_2O ha^{-1} through Potassium Schoenite and higher BC ratio was calculated with application of K_2O @ 40 kg ha^{-1} through Potassium Schoenite along with $MgSO_4$ and Bentonite sulphur.

***Keywords* :** Potassium Schoenite, Sweet corn, yield, economics

Introduction

Sweet corn (*Zea mays* L. *saccharata*) is an important crop cultivated worldwide owing to its tender, palatable kernels, nutritional value, and adaptability to diverse climatic conditions. It is widely grown for vegetable purposes in countries such as the USA, Canada, Thailand, Taiwan, Indonesia, and Sri Lanka. In India, sweet corn is extensively cultivated in Maharashtra, Meghalaya, Karnataka, and Andhra Pradesh (Mishra, 2018). The crop possesses a naturally occurring sugary gene that results in high sugar and low starch content in the kernels (Sidahmed, 2025). Sucrose is the predominant sugar present in sweet corn, while maltose, glucose, and fructose occur in smaller quantities (Cobb and Hannah, 1981). Owing to its superior taste and nutritional attributes, sweet corn has considerable market potential and economic value in India (Sahoo and Mahapatra, 2007). The demand for sweet corn has increased in urban areas, including parks, theatres, exhibitions, and other public places, due to its nutritional benefits and consumer preference.

Achieving higher yields and improved quality in sweet corn largely depends on optimum plant population and balanced nutrient management. Potassium is an essential nutrient for sweet corn production as it significantly influences growth, yield, and quality. Adequate potassium supply improves plant vigor, enhances resistance to diseases, pests, and environmental stresses such as drought, and promotes efficient utilization of nitrogen. In sweet corn, potassium plays a crucial role in carbohydrate synthesis, sugar accumulation, and translocation, which directly affects kernel sweetness, cob size, and overall market quality. It also contributes to better grain filling, stronger stalks, and improved yield, making it one of the most important nutrients for profitable sweet corn cultivation (Bachute, 2019).

Potassium schoenite ($K_2SO_4 \cdot MgSO_4 \cdot 6H_2O$) is a naturally occurring double salt containing potassium, magnesium, and sulphur (Peptech Biosciences Ltd., n.d.). It serves as an excellent source of these three essential plant nutrients. Potassium improves crop growth, yield, and quality, while sulphur plays a vital role in nitrogen assimilation and protein synthesis (Manjunath, 2011). Magnesium is a key component of chlorophyll and is essential for photosynthesis, leading to increased biomass production and plant growth (Adriaje, 2025). The combined supply of potassium, magnesium, and sulphur through schoenite enhances nutrient use efficiency, photosynthetic activity, and overall productivity of sweet corn.

Materials and Methods

A field experiment was conducted at the AICRP on maize farm, Zonal Agricultural Research Station Farm, Sub-montane Zone, Kolhapur, Maharashtra during *kharif* of 2025. To find out influence of Potassium Schoenite on growth, yield and economics of *kharif* sweet corn. The soil and plant analytical work was carried out in the research laboratories at Zonal Agricultural Research Station and RCSM Govt. College of Agriculture, Kolhapur, Maharashtra. The soil of experimental site was initially neutral in nature having pH of 6.91 with low soluble salts (0.26 dSm^{-1}), organic carbon (0.40%), calcium carbonate (0.91%) and soil available nitrogen (163.07 kg ha^{-1}), medium in available phosphorus (20.80 kg ha^{-1}), available potassium (169.56 kg ha^{-1}) and available sulphur (12.22 mg kg^{-1}).

The experiment was comprised eight potassium management treatments and three replications comprising T_1: absolute control, T_2: 40 kg K_2O through MOP as basal, T_3: 40 kg K_2O through MOP along with $MgSO_4$ @ 119.9 kg ha^{-1} and Bentonite sulphur @ 13.04 kg ha^{-1} as basal, T_4: No recommended dose of K_2O (only recommended dose of nitrogen and phosphorus), T_5: K_2O @ 30 kg ha^{-1} through Potassium Schoenite, T_6: K_2O @ 40 kg ha^{-1} through Potassium Schoenite, T_7: K_2O @ 50 kg ha^{-1} through Potassium Schoenite, T_8: K_2O @ 60 kg ha^{-1} through Potassium Schoenite. K_2O through Potassium Schoenite was applied in four equal splits @ Basal, 25, 45 and 55 DAS. FYM 10 t ha^{-1}, N :120 kg ha^{-1} and P_2O_5 :60 kg ha^{-1} was common to treatment T_2 to T_8. Treatment T_3 was design as a compensatory treatment of treatment T_6.

Sweet corn seeds at the rate of 15 kg ha^{-1} were sown at spacing of 60 cm X 20 cm. The seed were sown on 3 July 2025, and harvested in two pickings on 16 September (75 DAS) and 21 September 2025 (80 DAS). The biometric observations were recorded from five randomly selected plants within net plot. The parameters observed included plant height (cm), cob girth (cm), cob length (cm), number of cobs $plot^{-1}$, 100 seed weight (g) and weight of grain cob^{-1} (g). The green cob yield was determined by harvesting the cobs from the net plot area, with the recorded weights subsequently converted and expressed in quintals per hectare (q ha^{-1}). Following the harvest of the green cobs, the remaining stover was cut close to the ground level, weighed, and the yield was calculated in quintals per hectare (q ha^{-1}). The recorded observations were subjected to statistical analysis to accurately evaluate the effects of the applied treatments on the growth and yield attributes of the crop.

Economic feasibility of the Potassium Schoenite treatments on sweet corn was calculated based on prevailing local market rates during the kharif season. Cost of cultivation was calculated of different treatments by adding total expenditure incurred from land preparation to harvest, including inputs, labour and machinery cost and represented Rs. ha^{-1}.

Gross monetary return was calculated by multiplying prices of cob yield and stover yield separately and added them both and presented in Rs. ha^{-1}.

$$Gross\ Returns = (Cob\ Yield \times Price) + (Fodder\ Yield \times Price)$$

Net monetary return was estimated by subtracting cost of cultivation from gross returns.

$$Net\ Returns = Gross\ Returns - Cost\ of\ Cultivation$$

The Benefit-Cost Ratio was calculated to evaluate the relative economic efficiency of each fertilizer treatment. It represents the financial return generated for every single rupee invested, and was computed by dividing the gross monetary returns by the total cost of cultivation.

$$B:C = \frac{Gross\ Returns}{Cost\ of\ Cultivation}$$

Results and Discussions

The data on growth parameter, yield characteristics, yield and economics of sweet corn as influenced by different potash management approaches with their statistical inference are presented and analysed as under:

Growth parameters

The data on the mean plant height of sweet corn at the time of harvest presented in table 1 showed significant differences due to the varied potassium treatments. Plant height is an important measure of vegetative vigour and overall crop growth. The statistical analysed data critically shows the targeted application of Potassium Schoenite has directly influenced the structural development and physiological elongation of the sweet corn plants throughout kharif season. The plant height of 196.13 cm was recorded under the application of 40 kg K_2O ha^{-1} through potassium schoenite. This treatment was exhibited at par relations under treatment T_7, T_8, and T_3 which was recorded sweet corn plant height to the tune of 195.07, 191.80 and 188.87 cm respectively. The lowest plant height (148.07 cm) was recorded by absolute control T_1.

The increase in height of the plants can be related to the 11% magnesium (Mg) content of Potassium Schoenite. Magnesium is important for vegetative growth as it raises the chlorophyll concentration in the leaves, which in turn enhances the accumulation of photosynthates in the plant tissues. Similar finding was reported by Parmar (2020) in his work on lucerne, where the treatment of potassium through Schoenite similarly gave maximum plant height. Similar results found by Patil and Basavraja (2017) and Ghosh *et al.* (2017).

Plant height of sweet corn was also found to follow a certain trend where the height was greatest at the acceptable dose of potassium (40 kg K_2O ha^{-1}) and then with further increase in the application rate a diminishing tendency was noticed. These findings are highly consistent with the results of Bhagat (2022) and Parmar (2020) who similarly showed a decline in plant height with increased levels of Potassium Schoenite above a certain physiological limit. This implies that there are no additional growth benefits from exceeding the authorised dose, and that an imbalance in nutrition or ionic interference may occur that limits vertical development.

Table 1: Influence of potassium schoenite application on yield attributes of sweet corn

Tr. No.	Treatments	Plant height (cm)	Cob girth (cm)	Cob length (cm)	Cobs $plot^{-1}$	100 Seed weight dried (g)	Weight of fresh grain cob^{-1} (g)
T_1	Absolute Control	148.07	14.74	14.90	54.00	12.33	159.97
T_2	RD of K_2O @ 40 kg ha^{-1} through MOP	180.40	17.12	16.52	78.33	13.10	184.12
T_3	RD of K_2O @ 40 kg ha^{-1} through MOP + $MgSO_4$+ Bentonite S	188.87	18.32	17.91	85.33	14.73	214.31
T_4	No Recommended Dose of K_2O	174.73	15.13	16.25	74.67	11.03	171.14
T_5	K_2O @ 30 kg ha^{-1} through Potassium Schoenite	185.33	17.70	17.69	83.00	14.30	208.96
T_6	K_2O @ 40 kg ha^{-1} through Potassium Schoenite	196.13	18.78	18.53	94.33	15.17	221.01
T_7	K_2O @ 50 kg ha^{-1} through Potassium Schoenite	195.07	18.72	18.12	90.00	14.83	219.38
T_8	K_2O @ 60 kg ha^{-1} through Potassium Schoenite	191.80	18.29	17.89	89.33	14.77	217.93
	SE (m)±	6.60	0.54	0.67	3.78	0.62	9.44
	CD @ 5%	20.03	1.65	2.04	11.48	1.87	28.62

Yield attributes

Data related to yield attributes of sweet corn influenced by potassium sources on mean basis are presented in table 1.

Results revealed that through cob girth, cob length, cobs $plot^{-1}$, 100 seed weight and weight of grain cob^{-1} was significantly influenced by different treatments. Treatment T_6 which consist of four equal splits of K_2O *i.e.* application of 40 kg K_2O ha^{-1} through Potassium Schoenite at basal, 25, 45 and 55 DAS was significantly superior cob girth (18.78 cm) and it was at par with T_7, T_3 and T_8. However, the treatment which was applied with potassium through schoenite recorded greater numerical value than MOP with magnesium sulphate and bentonite (T_3) individually which demonstrated the usefulness of its balanced nutrient composition in the growth phases of sweet corn. This confirms the findings of Alekya (2022). Same trend was observed for cob length (18.53 cm), number of cob $plot^{-1}$ (94.33), 100-seed weight (15.17 g) and weight of grains cob^{-1} (221.01 g). The superior performance of the schoenite treated plots can be attributed to the balanced supply of potassium and magnesium, which enhances the translocation of photosynthates and ensures better grain filling (Raiyani *et al.,* 2021). similar results were reported by Rathore *et al*. (2014).

Green cob and fresh stover yield

The data on green cob yield and stover yield as affected by treatments were presented in table 2. The results showed that application of potassium from different sources had a significant effect on green cob production and stover output of sweet corn. Among all the treatments studied, the treatment with four equal splits of K_2O *i.e.* application of 40 kg K_2O ha^{-1} through Potassium Schoenite at baseline, 25, 45 and 55 DAS had yielded apparently greater green cob yield of 140.95 q ha^{-1}. However, it was still at par with treatments T_7, T_8 and T_3. Specifically, cob yield in T_6 was found to be greater than the absolute control T_1 (45.27 q ha^{-1}) and T_6 discovered higher than treatment T_2 and T_3. Treatment T_6 recorded significantly greater cob production than T_3 (130.66 q ha^{-1}) where compensatory Mg and S were applied together with MOP. This is consistent with the findings of Alekya, (2022).

Table 2: Influence of potassium schoenite application on cob and stover yield of sweet corn

Tr. No.	Treatments	Green cob yield (q ha^{-1})	Fresh stover yield (q ha^{-1})
T_1	Absolute Control	45.27	76.81
T_2	RD of K_2O @ 40 kg ha^{-1} through MOP	112.52	200.28
T_3	RD of K_2O @ 40 kg ha^{-1} through MOP + $MgSO_4$+ Bentonite S	130.66	239.06
T_4	No Recommended Dose of K_2O	86.75	163.45
T_5	K_2O @ 30 kg ha^{-1} through Potassium Schoenite	127.66	231.11
T_6	K_2O @ 40 kg ha^{-1} through Potassium Schoenite	140.95	259.14
T_7	K_2O @ 50 kg ha^{-1} through Potassium Schoenite	134.09	248.96
T_8	K_2O @ 60 kg ha^{-1} through Potassium Schoenite	131.09	239.96
	SE (m)±	5.31	9.00
	CD @ 5%	16.12	27.29

Results of stover yield showed that significantly higher stover yield (259.14 q ha^{-1}) of sweet corn under application of 40 kg K_2O ha^{-1} through Potassium Schoenite at baseline, 25, 45 and 55 DAS in four equal splits. However, this was closely followed by T_7 which consist 50 kg K_2O ha^{-1} through Potassium Schoenite (248.96 q ha^{-1}) and T_8 contain 60 kg K_2O ha^{-1} through Potassium Schoenite (239.96 q ha^{-1}), The stover yield in T_6 was higher than the absolute control T_1, which recorded the significantly lowest stover yield of 76.81 q ha^{-1}. An increase in stover yield under the treatments is mainly attributed to growth attributing parameter like plant height.

Critical observation in the present investigation was the reaction of sweet corn to increasing levels of potassium dosages. It was observed that the yield characteristics were raised up to the indicated dose by Potassium Schoenite (T_6: 40 kg K_2O ha^{-1}) but subsequent increase in the potassium dose (T_7 and T_8) resulted in decrease in green cob yield and stover yields gradually. This tendency of loss in production at increasing levels of potassium is in conformity with the findings of Alum *et al*., (2009), Parmar (2020) and Zahan *et al*., (2009).

Cob and stover yields were significantly lower in T_4 (0 kg K_2O ha^{-1}) compared to treated plots (T_2 to T_8) due to lack of potassium. This indicates that in the absence of potassium sweet corn yield is reduced even in the presence of adequate nitrogen and phosphorus. Bhagat (2022) reported similar results and stated that potassium deficit hampers enzyme activation and photosynthate translocation therefore affecting source to sink relationship. The sulphur present in Potassium Schoenite significantly improves nitrogen assimilation, thereby boosting overall biomass and grain development. These findings align closely with Manjunath (2011).

Economics

Table 3 presents the per-hectare economic analysis of the various potassium management strategies in sweet corn, including the cost of cultivation, gross income, net realization, and B:C ratio.

Table 3: Economics of sweet corn as influenced by potassium schoenite

Tr. No.	Treatments	Yield (q ha^{-1})		Treatment cost (Rs. ha^{-1})	Gross monetary return (Rs. ha^{-1})	Cost of cultivation (Rs. ha^{-1})	Net monetary return (Rs. ha^{-1})	B:C
		Cob	Stover					
T_1	Absolute Control	45.27	76.81	0	102056	70900	31156	1.44
T_2	RD of K_2O @ 40 kg ha^{-1} through MOP	112.52	200.28	27801	301208	98701	202507	3.05
T_3	RD of K_2O @ 40 kg ha^{-1} through MOP + $MgSO_4$	130.6	239.06	30584	350746	101484	249262	3.4

	+ Bentonite S	6						6
T_4	No Recommended Dose of K_2O	86.75	163.45	25544	233575	96444	137131	2.42
T_5	K_2O @ 30 kg ha^{-1} through Potassium Schoenite	127.66	231.11	37283	342322	108183	234139	3.16
T_6	K_2O @ 40 kg ha^{-1} through Potassium Schoenite	140.95	259.14	41196	378552	112096	266456	3.38
T_7	K_2O @ 50 kg ha^{-1} through Potassium Schoenite	134.09	248.96	45110	360495	116010	244486	3.11
T_8	K_2O @ 60 kg ha^{-1} through Potassium Schoenite	131.09	239.96	50641	351914	121541	230373	2.90
	SE (m)±						26796.30	
	CD @ 5%						81274.00	

Note: Fixed cost: Rs. 70900 ha^{-1}; Selling price: Green cob: Rs. 2410 q^{-1}, Stover (Fresh): Rs. 150 q^{-1}

Appraisal of data presented in table 3 revealed that maximum net monetary return of Rs. 266456 ha^{-1} was recorded under application of 40 kg K_2O ha^{-1} through Potassium Schoenite followed by treatment T_3 where 40 kg K_2O through MOP along with $MgSO_4$ @ 119.9 kg ha^{-1} and Bentonite sulphur @ 13.04 kg ha^{-1} of Rs. 249262 ha^{-1}. Lowest net monetary of Rs. 31156 ha^{-1} was observed under absolute control (T_1) treatment.

The highest benefit-cost ratio was found in treatment T_3 consist K_2O @ 40 kg ha^{-1} through MOP+$MgSO_4$+S (3.46) followed by T_6. This difference was seen because of the huge variation in the market prices of Potassium Schoenite (Rs. 90 kg^{-1}) and Muriate of Potash (MOP) (Rs. 34 kg^{-1}). The higher cost of Potassium Schoenite increased the total cost of cultivation in treatment T_6 considerably and hence reduced the B:C ratio as compared to T_3, despite higher total yields. The lowest gross monetary returns, net monetary returns and B: C ratio were recorded in the absolute control.

Conclusion

In light of this field experiment, it can be suggested that higher growth, yield attributes and yield of *kharif* sweet corn could be achieved with an application of 40 kg K_2O ha^{-1} through Potassium Schoenite. However, when it comes to return it can be suggested that higher benefit cost ratio could be achieved with an application of 40 kg K_2O through MOP along with $MgSO_4$ @ 119.9 kg ha^{-1} and Bentonite sulphur @ 13.04 kg ha^{-1} due to high-cost differences in MOP and Potassium Schoenite. However, it might be possible if we use potassium schoenite by foliar spray, cost of cultivation will reduce and Benefit cost ratio for treatments of potassium schoenite will increase. So, further experiments on foliar spray of potassium schoenite on sweet corn are necessary to guide recommendations to farmer.

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