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Effect of different levels of nitrogen and potassium on economics of sweet corn

SP Umbarkar, AP Wagh, PK Nagre, AM Sonkamble and SG Bharad

Abstract
A field investigation on "Effect of different levels of nitrogen and potassium on economics of sweet corn (*Zea mays* (L). var. *Saccharata*)" was carried out at Instructional Farm, Department of Vegetable Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during summer season of year 2018-19. The experiment was laid out in Factorial Randomized Block Design having fifteen (15) treatment combinations and three (3) replications. Among the two factors studied, the factor A *i.e.* nitrogen (N) was applied in five different levels *i.e.* N_1 (150 kg ha^{-1}), N_2 (175 kg ha^{-1}), N_3 (200 kg ha^{-1}), N_4 (225 kg ha^{-1}) and N_5 (250 kg ha^{-1}). While, another factor B *i.e.* potassium (K) was applied in 3 different levels such as K_1 (60 kg ha^{-1}), K_2 (80 kg ha^{-1}), K_3 (100 kg ha^{-1}). Cob yield with husk per hectare was observed maximum at level N_5 (250 kg ha^{-1}), level K_3 (100 kg ha^{-1}) and treatment combination N_4K_2 (225 kg N + 80 kg K_2O ha^{-1}). Green fodder yield per hectare was observed maximum at level N_5 (250 kg ha^{-1}), level K_3 (100 kg ha^{-1}) and treatment combination N_5K_3 (250 kg N + 100 kg K_2O ha^{-1}). Highest net return and highest benefit cost ratio were observed at treatment combination N_4K_2 (225 kg N + 80 kg K_2O ha^{-1}).

Keywords: Nitrogen, Potassium, Sweet corn, benefit cost ratio, green fodder

Introduction
Vegetables are the major source of nutrition owing to their high protective food values like protein, carbohydrate, minerals and vitamins, which helps to maintain the essential balance diet for functioning of human body. According to ICMR's recommendations daily per capita requirement of vegetables in India is 125 g green leafy vegetables, 100 g roots and tubers and 75 grams other vegetables *i.e* overall 300 grams. Sweet corn belongs to family *Gramineae*, having diploid chromosome number 2n=20. Mexico is considered to be the center of origin of sweet corn. In many parts of the world corn is the most important food source and one of the most efficient field crops. Sweet corn is considered as the genetic mutation of the field corn. Sweet corn is a warm season vegetable that can be grown easily with sufficient light in any garden. Sweet corn is photo insensitive crop and it is monoecious i.e. staminate and pistillate flowers are born on separate inflorescence on the same plant. Sweet corn is normally cross pollinated crop being the well adapted to wind pollination. It may bear one or more ears per plant. It is picked when immature i.e. milky stage prepared and eaten as a vegetable rather than grain. Roasted green cobs provide starch, fat, protein, sugar, minerals and vitamins in palatable and digestible form at relatively low cost. It is gaining importance in the hotels and urban area for the preparation of special soups, sweets and other delicious eatables. As compared to the global growth in the sweet corn production India is not registering adequate growth (Venkatraman 2007) [7]. So, spreading awareness and giving proper economic calculations is of vital importance in India.

Material and methods
Experimental Site
The present investigation of field experiment was laid out during summer season of year 2018-19 at the Instructional Farm, Department of Vegetable Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (MS).

Climate and weather conditions
Akola is situated in sub-tropical region between 22.20^0 N latitude and 77.02^0E longitudes. The altitude of place is 307.2 m above mean sea level. The climate of Akola is semi-arid and characterized by three distinct seasons, *i.e.* warm humid and rainy monsoon from June to October, mild cold winter from November to February and hot dry summer from March to May.

Methodology
The experiment was laid out in Factorial Randomized Block Design having fifteen (15) treatment combinations and three (3) replications. Among the two factors studied, the factor A *i.e*. nitrogen (N) was applied in five different levels *i.e*. N_1 (150 kg N ha^{-1}), N_2 (175 kg N ha^{-1}), N_3 (200 kg N ha^{-1}), N_4 (225 kg N ha^{-1}) and N_5 (250 kg Nha^{-1}). While, another factor B *i.e*. potassium (K) was applied in 3 different levels such as K_1 (60 kg K_2O ha^{-1}), K_2 (80 kg K_2O ha^{-1}), K_3 (100 kg K_2O ha^{-1}).

Gross monetary returns: Total returns obtained from cobs + Total returns obtained from fodder.
(Rate of cobs @ 10 Rs. kg^{-1} and rate of fodder @ 1 Rs. kg^{-1})

Net monetary returns: Gross monetary returns – Total cost of cultivation

Benefit cost ratio (B:C ratio) = Gross monetary returns / Total cost of cultivation

Cost of cultivation: Ploughing charges + harrowing charges + seed charges + pesticides charges + electricity charges + water charges + labour charges + fertilizer charges + transporting charges + land rent + interest on working capital.

Results and discussion
Cob yield with husk per hectare was observed maximum at level N_5 (250 kg ha^{-1}), level K_3 (100 kg ha^{-1}) and treatment combination N_4K_2 (225 kg N + 80 kg K_2O ha^{-1}). Green fodder yield per hectare was observed maximum at level N_5 (250 kg ha^{-1}), level K_3 (100 kg ha^{-1}) and treatment combination N_5K_3 (250 kg N + 100 kg K_2O ha^{-1}). These results might be due to the application of higher amount of nitrogen levels which resulted in more number of cobs per plant and thereby resulted into the maximum cob and fodder yield per ha. Such similar kind of results have also been observed by Panchbhai (2013) [3] and Thakur *et al.* (2009) [6] in sweet corn, Singh *et al.* (1995) [5] in maize and Kumar and Bohra (2014) [2] and Asghar *et al*. (2010) [1] in baby corn.
The data regarding the cost of cultivation and benefit cost ratio which was listed in the table 2 indicated that highest net return (255289 Rs/ha) and highest benefit cost ratio (3.69) was recorded from treatment N_4K_2 *i.e*. 225 kg N and 80 kg K_2O ha^{-1}. Whereas, the lowest benefit cost ratio (2.58) was obtained with treatment 150 kg nitrogen and 60 kg of potassium per ha. Such kind of results also have been given by Thakur *et al*. (2009) [6] and Sahoo and Mahapatra (2007) [4] in sweet corn.

Table 1: Effect of nitrogen and potassium levels on cob and fodder yield of sweet corn

Treatments	Cob yield with husk (t ha^{-1})	Green fodder yield (t ha^{-1})
N_1	21.23	46.47
N_2	24.28	48.42
N_3	26.02	51.88
N_4	28.06	55.48
N_5	28.40	59.58
'F' test	Sig.	Sig.
SE(m)±	0.20	0.36
CD at 5%	0.57	1.04
K_1	24.88	51.35
K_2	26.10	52.31
K_3	25.82	53.44
'F' test	Sig.	Sig.
SE(m)±	0.15	0.28
CD at 5%	0.44	0.81
Interaction		
$N_1 K_1$	19.69	45.94
$N_1 K_2$	21.57	46.41
$N_1 K_3$	22.44	47.07
$N_2 K_1$	23.93	47.83
$N_2 K_2$	24.19	48.50
$N_2 K_3$	24.72	48.92
$N_3 K_1$	25.31	50.37
$N_3 K_2$	26.25	52.08
$N_3 K_3$	26.50	53.19
$N_4 K_1$	27.17	53.73
$N_4 K_2$	29.49	55.25
$N_4 K_3$	27.53	57.46
$N_5 K_1$	28.29	58.89
$N_5 K_2$	29.01	59.31
$N_5 K_3$	27.90	60.54
'F' test	Sig.	Sig.
SE(m)±	0.34	0.62
CD at 5%	0.99	1.80

Table 2: B:C ratio analysis of sweet corn

Treatments	Gross Monetary Returns (Rs. ha^{-1})	Cost of Cultivation (Rs. ha^{-1})	Net Monetary Returns (Rs. ha^{-1})	B:C Ratio
$N_1 K_1$	242840	93992	148848	2.58
$N_1 K_2$	262110	94366	167744	2.77
$N_1 K_3$	271470	94740	176730	2.86
$N_2 K_1$	287130	94157	192973	3.05
$N_2 K_2$	290400	94531	195869	3.07
$N_2 K_3$	296120	94905	201215	3.12
$N_3 K_1$	303470	94322	209148	3.22
$N_3 K_2$	314580	94696	219884	3.32
$N_3 K_3$	318190	95070	223120	3.35
$N_4 K_1$	325430	94487	230943	3.44
$N_4 K_2$	350150	94861	255289	3.69
$N_4 K_3$	332760	95235	237525	3.49
$N_5 K_1$	341790	94652	247138	3.61
$N_5 K_2$	349410	95026	254384	3.67
$N_5 K_3$	339540	95400	244140	3.56

Conclusion
From the above results it can be concluded that the cob yield with husk per hectare was recorded maximum at treatment combination N_4K_2 (225 kg N + 80 kg K_2O ha^{-1}), but the green fodder yield was observed maximum at treatment combination N_5K_3 (250 kg N + 100 kg K_2O ha^{-1}), whereas

highest net return and highest benefit cost ratio were observed in the treatment combination N_4K_2 (225 kg N + 80 kg K_2O ha^{-1}).

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