Performance evaluation of pre-release sweet corn hybrids under varying plant density and nutrient levels

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ABSTRACT

Field experiment was conducted at the Department of Millets, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu during kharif 2019 to evaluate the performance of pre-release sweet corn hybrids under varying plant density and nutrient levels. The soil was sandy clay loam, low in available N, medium in available P and high in available K. The experiment was laid out in split-split plot design. In the main plot, two plant densities viz 60 cm x 20 cm and 60 cm x 15 cm, in the sub-plot, two nutrient levels viz 100 per cent RDF (120:60:45 NPK kg/ha) and 150 per cent RDF (180:90:68 NPK kg/ha) and in the sub-sub-plot, two pre-release sweet corn hybrids viz Nuzi 260 and Misthi were tried in three replications. Based on the results of experimentation it was found that among the sweet corn hybrids, NUZI 260 was the most promising hybrid under a spacing of 60 cm x 20 cm with application of 150 per cent recommended dose of fertilizer ie 180:90:68 NPK kg/ha.

Keywords: Sweet corn; hybrids; planting density; nutrient levels; yield

INTRODUCTION

Sweet corn is gaining popularity among the farmers owing to increasing demand in the market as it has more sweetness with a sugar content of 16-18 per cent compared to other specialty corn (Sahoo and Mahapatra 2004). Besides sweetness, it is rich in carbohydrate especially water soluble polysaccharide, vitamins having considerable amount of dietary fibre and potassium (Santos et al 2014). It is rich in antioxidants and carotenoids like xanthophyll, lutein and zeaxanthin thus protecting from various diseases (More et al 2018, Ozata 2019). The green cobs are consumed as raw or used for preparing soup, syrup, jam, cream, paste etc and the stover is used for feeding milch animals as green fodder due to its greenness even after the harvest of cobs.

Genetic makeup, environment and agro-techniques are the key factors in determining the yield of sweet corn. Proper selection of sweet corn varieties or hybrids with appropriate plant density ensures desirable yield (Kara and Atar 2013). In respect of environmental factors, temperature and rainfall or irrigation play a vital role in influencing yield of sweet corn. Cultivation of sweet corn in a suitable season provides congenial environment thus favouring yield. Improper distribution of rainfall during cropping period leads to decline in yield which can be averted through supplemental irrigation. Maximum genetic potential of sweet corn can be exploited by growing it under irrigated condition. Amongst agro-techniques, plant density and nutrient management are the deciding factors in enhancing its yield (Saleem 2003). Kumar and Chawla (2018) reported that plant density significantly influenced the yield components consequently yield of sweet corn. Recommended plant density results in effective utilization of resources leading to improved growth and development of crop. Being an exhaustive and nutrient-mining crop, it removes more quantities of macro and micronutrients from the soil (Akpan and Udoh 2017). Insufficient supply of nitrogen influences absorption and translocation of other nutrients resulting in yield reduction (Haque et al 2001). Thus yield of sweet corn can be enhanced through supply of nitrogen, phosphorus and potassium in adequate amount and time. Hence the present study was conducted to evaluate the performance of pre-release sweet corn hybrids under varying plant density and nutrient levels.

MATERIAL and METHODS

Field experiment was conducted at the Department of Millets, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu during kharif season 2019 to evaluate the performance of pre-release sweet corn hybrids under varying plant density and nutrient levels. The soil was sandy clay loam, low in available N, medium in available P and high in available K. The experiment was laid out in split-split plot design. In the main plot, two plant densities viz D_1 (60 cm x 20 cm) and D_2 (60 cm x 15 cm), in the sub-plot, two nutrient levels viz N_1 (100% RDF- 120:60:45 NPK kg/ha) and N_2 (150% RDF- 180:90:68 NPK kg/ha) and in the sub-sub-plot two pre-release sweet corn hybrids viz H_1 (Nuzi 260) and H_2 (Misthi) were tried in three replications. Observations on plant height at harvest, days to 50 per cent tasseling, days to 50 per cent silking, green cob yield, green fodder yield and TSS were recorded.

RESULTS and DISCUSSION

Response of pre-release sweet corn hybrids to different planting density and NPK levels (Table 1)

The data reveal that planting density exerted significant influence on number of plants per ha. Higher plant density of 1,05,700 plants/ha was recorded under 60 cm x 15 cm which was significantly superior to 60 cm x 20 cm spacing. However nutrient levels and hybrids had no significant influence on the number of plants/ha. Planting densities did not evince significant influence on plant height at harvest. The observation is contrary to the finding of Nandeha et al (2016).

Application of 150 per cent RDF (180:90:68 NPK kg/ha) recorded higher plant height of 189.4 cm which was higher than 100 per cent RDF (120:60:45 NPK kg/ha). This can be ascribed to more availability of nutrients to the plants which improved the vegetative growth. The results are in accordance with the findings of Singh et al (2019). Among the hybrids, Nuzi 260 recorded higher plant height of 188.1 cm which was superior to Misthi. This might be due to genetic makeup of the hybrids.

Planting densities, nutrient levels and hybrids had significant difference in respect of 50 per cent tasseling. Tasseling (50%) was earlier in 60 cm x 15 cm, 100 per cent RDF and in Nuzi 260. This can be ascribed to more competition for resources like space, water, light and nutrients. There was no effect of treatments of 50 per cent silking. The results are in conformity with the findings of Kumar et al (2007). There was no significant influence of nutrient level and hybrids on number of cobs per ha. Whereas number of cobs per ha was significantly influenced by planting density. Among them, 60 cm x 15 cm spacing recorded higher number of cobs per ha than 60 cm x 20 cm. This could be due to higher plant population per unit area. The results are in line with the findings of Mathukia et al (2014).

Planting density exerted significant influence on green cob yield. Among the planting densities, 60 cm x 15 cm spacing recorded higher green cob yield of 22,636 kg/ha which was significantly superior to 60 cm x 20 cm. This might be ascribed to higher plant population which effectively utilized the resources thus favoured higher dry matter production consequently the yield. The results are in concurrence with the findings of Kumar and Chawla (2018). Nutrient level did not evince significant influence on green cob yield. The results are contrary to the findings of Dangariya et al (2017) and Rao et al (2020) who reported increased yield with enhanced level of fertilizers. Among the sweet corn hybrids, no significant influence on green cob yield was observed.

Spacing 60 cm x 15 cm spacing recorded higher green fodder yield of 28,180 kg/ha. This might be due to higher biomass production by more plant population per unit area through effective utilization of resources. The results are in accordance with the findings of Sunitha and Reddy (2012) and Kumar and Narayan (2018). Treatment 150 per cent RDF recorded higher green fodder yield of 26,046 kg/ha. This can be ascribed to increased photosynthetic activity coupled with high rate of assimilation which enhanced the yield. Similar findings were reported by Kumar and Chawla (2018). In respect of hybrids, Misthi recorded higher green fodder yield of 26,228 kg/ha. This can be ascribed to improved vegetative growth favoured by the genetic makeup of plants. The treatments had no significant influence on TSS.

Green cob yield and economics of pre-release sweet corn hybrids (Table 2)

Among the sweet corn hybrids, Nuzi 260 recorded higher green cob yield of 23,680 kg/ha under 60 cm x 20 cm spacing with 150 per cent RDF. This was closely followed by the same hybrid under 60 cm x 15 cm spacing with 150 peer cent RDF. In respect of economics, Nuzi 260 under 60 cm x 20 cm spacing

Table 1. Response of pre-release sweet corn hybrids to different planting density and NPK levels

Treatment	Plants ('000/ha)	Plant height at harvest (cm)	Days to 50% tasseling	Days to 50% silking	Cobs ('000/ha)	Green cob yield (kg/ha)	Green fodder yield (kg/ha)	TSS (%)
Main plot (plant density)								
D_1	79.4	187.6	51.4	52.2	74.7	20,247	22,946	17.3
D_2	105.7	186.4	48.8	51.4	100.0	22,636	28,180	18.1
$CD_{0.05}$	7.7	NS	0.9	NS	6.6	1,062	2,113	NS
Sub-plot (nutrient level)								
N_1	92.8	184.6	46.9	51.6	87.9	19,747	25,080	17.6
N_2	92.3	189.4	49.3	52.0	86.8	23,135	26,046	17.8
$CD_{0.05}$	NS	2.94	1.7	NS	NS	NS	382	NS
Sub-sub-plot (hybrid)								
H_1	92.0	188.1	46.3	51.0	86.9	22,053	24,898	17.7
H_2	93.1	185.9	49.8	52.6	87.7	20,829	26,228	17.8
$CD_{0.05}$	NS	2.1	1.4	NS	NS	NS	1,019	NS

D_1: 60 x 20 cm, D_2: 60 x 15 cm; N_1: 100% RDF- 120:60:45 NPK kg/ha, N_2: 150% RDF- 180:90:68 NPK kg/ha; H_1: Nuzi 260, H_2: Misthi

with 150 per cent RDF registered the highest net return (Rs 1,12,810/ha) and B-C ratio (3.12).

CONCLUSION

Based on the results of experimentation, it is concluded that among the sweet corn hybrids, Nuzi 260 was found to be the most promising hybrid under a spacing of 60 cm x 20 cm with application of 150 per cent recommended dose of fertilizer ie 180:90:68 NPK kg/ha.

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Table 2. Green cob yield and economics of pre-release sweet corn hybrids

Treatment	Green cob yield (kg/ha)	Net return (Rs/ha)	B-C ratio
$D_1N_1H_1$	19,327	79,043	2.56
$D_1N_1H_2$	15,907	72,588	2.43
$D_1N_2H_1$	23,680	1,12,810	3.12
$D_1N_2H_2$	21,233	1,05,565	2.98
$D_2N_1H_1$	22,862	1,09,670	3.08
$D_2N_1H_2$	22,463	1,06,158	3.01
$D_2N_2H_1$	24,010	1,15,443	3.09
$D_2N_2H_2$	21,298	1,08,611	2.97

D_1: 60 x 20 cm, D_2: 60 x 15 cm; N_1: 100% RDF- 120:60:45 NPK kg/ha, N_2: 150% RDF- 180:90:68 NPK kg/ha); H_1: Nuzi 260, H_2: Misthi

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