International Journal of Scientific Engineering and Research (IJSER)
ISSN (Online): 2347-3878
Index Copernicus Value (2015): 56.67 | Impact Factor (2017): 5.156

Effect of Plant Densities and Integrated Nutrient Management on Growth and Productivity of Sweet Corn (*Zea mays* L. Saccharata)

Jasvinder Kour[1], Neeraj Jain[2], Coguide Pankaj Singh[3], Himani[4]

[1, 2] Maharishi University of Information Technology, Lucknow

Abstract: ***An investigation was carried out to examine the effect of plant densities and Integrated Nutrient Management (INM) on growth and productivity of sweet corn during Winter season of 2016-17. The treatment consisting of three plant densities levels viz., C_1 - 60 cm x 20 cm (83,333 Plants ha^{-1}), C_2 - 45 cm x 20 cm (1, 11,111 Plants ha-^{1}), C_3 - 45 cm X 30 cm (74,074 Plants ha^{-1}) and seven levels of INM practices viz., T_1-100% RDF (120N, 60 P_2O, 60K_2O)- Control, T_2- 50% RDF NPK + Vermicompost, T_3-75% RDF NPK + Vermicompost, T_4- 50% RDF NPK +FYM, T_5-75% RDF NPK + FYM, T_6-50% RDF NPK + Azospirillum 5kg ha^{-1} and T_7-75% RDF NPK + Azospirillum 7.5kg ha^{-1}. The results indicated that plant densities of 45 cm x 30 cm exerted significantly higher growth and number of green cobs per hectare over rest of plant densities levels. Among the INM level 75% RDF+ Vermicompost recorded significantly higher growth and yield attributes, that resulted into higher number of green cobs per hectare.***

Keywords: Plant densities, INM,Sweet corn, Green Cob

1. Introduction

Maize(*Zea mays* L.) is one of the largest producing cereal crops in the world grown in more than 150 countries having 600 million ha area with 600 million ton of production. The major maize producing countries are USA, China, Brazil, Mexico, France and India. USA has the largest area and production in the world. Italy having highest productivity in the world 9600 kg ha^{-1} followed by France with 8800 kg ha^{-1}. In India, it is cultivated on an area of 9.0 million ha with a production of 26.0 million tonnes of grain and productivity of 2710 kg ha^{-1} (Anon., 2017).Maize contribute 15 % protein and 19 % of the calories derived from food crops in the peoples' diet globally.Out of various specialty corns, sweet corn is a mutant type with one or more recessive alleles in homozygous condition that enable the endosperm to accumulate twice the sugar content as that of seed corn.

Sweet corn is very common vegetable crop in North America. It is an exhaustive crop and it is harvested at milky stage and requires fertile soils for optimum production. As the corn is considered as an exhaustive crop, requires more nutrient, organic nutrient management practices play an important role in sustaining productivity of sweet corn. Fertilizer is by and large the most important resource affecting the production and productivity at all planting densities.Keeping this in view the present study wasundertaken with an objective to evaluate the performance of sweet maize under the combined use of organic and inorganic fertilizers at different plant densities.

2. Materials and Methods

The field experiment was undertaken at Experimental Research Bakshi ka taal at Lucknow season of 2016 and 2017. The soil of the experimental area was sandy loam with moderately alkaline pH (7.3) low in organic carbon (0.43%) and available N (191 kg ha^{-1}), available P (26.30 kg ha^{-1}) and available K (295.00 kg ha^{-1}). The experiment was laid out in Randomized Block Design (RBD) and replicated thrice. The sweet corn variety Sugar-75 was used as test crop. Fertilizers were applied as side placement, for which 4-5 cm deep furrows were made along the seed rows with a hand hoe. The 21 treatment combinations consisting three plant densities levels viz., C_1- 60 cm x 20 cm (83,333 Plants ha^{-1}), C_2-45 cm x 20 cm (1, 11,111 Plants ha-^{1}), C_3-45 cm X 30 cm (74,074 Plants ha^{-1}) and seven levels of INM practices *viz.*, T_1-100% RDF (120N, 60 P_2O, 60K_2O)- Control, T_2-50% RDF NPK + Vermicompost, T_3-75% RDF NPK + Vermicompost, T_4- 50% RDF NPK +FYM, T_5-75% RDF NPK + FYM, T_6-50% RDF NPK + Azospirillum 5kg ha^{-1} and T_7-75% RDF NPK + Azospirillum 7.5kg ha^{-1}.

All the agronomic practices were conducted uniformly for raising the crop. To examine various yield parameters on sweet corn a sample consisting of five plants was selected at random. The randomly five plants were selected for recording the average value of the number of cobs per plant.The length and girth of five randomly selected cobs (with husk) from each plot was measured and the average was worked out to get cob length and cob girth. The selected cobs were weighed (with husk) and the mean values of the weight of cob were recorded. The total number of cobs obtained from individual plant per square meter was weighed and the mean values were recorded for yield estimation. The cobs were picked up treatment wise and the harvested cobs were weighted after which the total number of cobs obtained from individual plants per square meter recorded and converted into number of cobs per ha. Green fodder was collected plot wise before dry plants were cut from ground level after picking of the cobs. It was weighted and the value attained was converted into tonnes per ha.

3. Results and Discussions

Effect on Growth Characters

A significant variation in growth parameters of sweet corn were observed due to different plant densities levels (Table-1). The plant spacing of 45 cm x 30 cm exhibited significantly higher plant height, number of leaves plant^{-1},

leaf area and dry matter production per plant as compared to 60 cm x 20 cm and 45 cm x 20 cm spacing levels. The wider plant spacing of 45 cm x 30cm recorded higher plant height, which may be due to efficient utilization of growth resources like sunlight, moisture and nutrients. The results are in conformity with the findings of Paygonde *et al.* (2008) and Kurne*et al.* (2017).

The effect of different Integrated Nutrient Management (INM) levels on the growth characters of sweet corn was found significant (Table-1). Application of 75% RDF (90:45:45 Kg NPK ha^{-1}) + Vermicompost recorded significantly higher plant height, number of leaves, leaf area and dry matter production per plant followed by 75% RDF NPK + FYM as compared to control. The increased plant height, number of leaves and leaf area with 75% RDF NPK + Vermicompostmay be due to increase in cell division, assimilation rate and metabolic activities in plant. The results were in agreement with those reported by Massey and Gaur (2006) and Kurne *et al.* (2017).Luikham et al., (2003) reported the maximum dry matter production by maize plants with the application of 135 kg N/ha and 10 t/ha FYM. In the present study maximum dry matter accumulation was observed under INM level of 75% RDF,+ Vermicompost which may be due to more availability of nutrients when inorganic fertilizer was applied with vermicompost.

Effect on yield Components

Among the plant densities levels, 45 cm x 30 cm recorded significantly higher green cob per plant (1.46) of sweet corn as well as per ha (130.68 thousand ha^{-1}). The results corroborated with those reported by Massey and Gaur (2006).

The effect of different INM levels on cob length, cob diameter, number of green cobs of sweet corn $plant^{-1}$ and per hectare was found significant (Table-2). Application of 75% RDF NPK +vermicompost recorded significantly cob length (18.66 cm), cob diameter (14.35 cm), number of green cobs (1.46) and number of green cobs per hectare (130.68 thousand).

Chemical fertilizer and integrated use of fertilizer did bring about significant improvement in overall growth of the crop by providing needed nutrients from initial stage and increase in supply of N, P and K in more synchronize way at the treatment receiving integrated supply of nutrient from organic manure along with inorganic fertilizer and which expressed in terms of plant height, number of leaves, leaf area, cob length and cob diameter by virtue of increased photosynthetic efficiency. Thus, greater availability of photosynthates, metabolites and nutrients to develop reproductive structures seems to have resulted in increased productive plants, cob length and cob diameter with these integrated nutrient management treatments. Similar results were reported by Rasool *et al.* (2015).

Table 1: Average Plant height, Number of leaves $Plant^{-1}$, Leaf Area and Dry Matter $Plant^{-1}$ and influenced by Plant densities and INM levels

Treatments	Plant Height (cm)	Number of Leaves $Plant^{-1}$	Leaf Area (dm^2)	Dry Matter $plant^{-1}$ (g)
Plant Densities Levels				
C_1- 60 cm x 20 cm (83,333 Plants ha^{-1})	175.34	8.24	56.81	118.25
C2-45 cm x 20 cm (1, 11,111 Plants ha-1)	165.65	7.89	55.15	114.43
C3-45 cm X 30 cm (74,074 Plants ha-1)	193.85	8.95	57.29	129.21
CD at 5%	8.210	0.86	1.23	3.76
INM Levels				
T1-100% RDF(120N, 60 P_2O, 60K_2O) Control	190.23	8.40	55.21	127.10
T2- 50% RDF NPK + Vermicompost	185.21	7.91	53.29	123.45
T3-75% RDF NPK + Vermicompost	199.12	8.98	57.86	127.58
T4- 50% RDF NPK +FYM	182.16	7.82	52.80	122.20
T5-75% RDF NPK + FYM	198.15	8.88	57.65	127.35
T6-50% RDF NPK + Azospirillum 5kg ha^{-1}	165.43	7.53	52.23	121.65
T7-75% RDF NPK + Azospirillum 7.5kg ha^{-1}	170.54	7.78	52.45	122.05
CD at 5%	0.87	0.43	0.32	0.17
Plant Density x INM Levels	NS	NS	NS	NS

It can be concluded that, the application of 75% RDF (90:45:45Kg NPK ha^{-1}) vermicompost found remunerative for higher productivity of sweet corn. In the same way, plant spacing of 45 cm x 30 cm was most found suitable for higher productivity of sweet corn during winter season.

Table 2: Average Plant height, Number of leaves $Plant^{-1}$, Leaf Area and Dry Matter $Plant^{-1}$ and influenced by Plant densities and INM levels

Treatments	Cob Length (cm)	Cob Diameter (cm)	Number of GreenCobs $Plant^{-1}$	Number of Green Cobs $ha^{-1(000)}$
Plant Densities Levels				
C_1- 60 cm x 20 cm (83,333 Plants ha^{-1})	17.95	14.21	1.48	123.33
C2-45 cm x 20 cm (1, 11,111 Plants ha-1)	17.26	13.72	1.35	150.00
C3-45 cm X 30 cm (74,074 Plants ha-1)	18.75	14.93	1.50	111.11
CD at 5%				
INM Levels				
T1-100% RDF(120N, 60 P_2O, 60K_2O) Control	17.85	14.05	1.40	125.31

T2- 50% RDF NPK + Vermicompost	16.55	13.85	1.36	121.73
T3-75% RDF NPK + Vermicompost	18.66	14.35	1.46	130.68
T4- 50% RDF NPK +FYM	16.22	13.72	1.34	119.94
T5-75% RDF NPK + FYM	18.35	14.15	1.42	127.10
T6-50% RDF NPK + Azospirillum 5kg ha^{-1}	15.45	13.67	1.24	110.99
T7-75% RDF NPK + Azospirillum 7.5kg ha^{-1}	15.83	13.70	1.26	112.78
Plant Density x INM Levels	NS	NS	NS	NS

References

[1] Anonymous (2017). NCoMM Special Reports: September 2017. Pp. 1-13.
[2] Kurne, R. A., Jadhav, Y. R. and Mohite, A. B. (2017). Effect of Fertilizer Levels and Plant Densities on Growth, Productivity and Economics of Sweet Corn in Summer Season. *Contemporary Research in India*, 7(3): 24-27.
[3] Luikham, E., Rajan, J. K., Rajendra, K. and Anal, P. S. M. 2003. Effect of organic and inorganic nitrogen on growth and yield of baby corn (*Zea mays* L.). *Agricultural Science Digest*, 23(2): 119–121.
[4] Massey, J. X. and Gaur, B. L. (2006). Effect of plant population and fertility levels on growth and NPK uptake by sweet corn (*Zea mays* L. Saccharata) cultivars. *Ann. of Agric. Res.*, 27(4): 365-368.
[5] Paygonde, C. D., Sawant, P. K., and Thorat, D. R. (2008). Influence of different weed control methods and planting patterns on cob yield and yield contributing characters of sweet corn. *J. of Maharashtra Agric. Univ.*, 33(3): 298-300.
[6] Rasool, S., Kanth, Hamid, R. H. S., Raja, W., Alie, B. A. and Dar, Z. A. (2015). Influence of Integrated Nutrient management on Growth and yield of sweet corn (*zea mays* L. *Saccharata*) under temperate conditions of Kashmir valley. *American Journal of Experimental Agriculture*, 7(5): 315-325.