Research Article

Effect of Varying Planting Density and Nutrient Levels on Pre Release Medium Maturity Maize Genotypes

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Abstract

Field experiment was conducted at Department of Millets, Tamil Nadu Agricultural University, Coimbatore during *Kharif*, 2016 in sandy clay loam soil to study the effect of varying planting density and nutrient levels on pre release medium maturity maize genotypes with their interactions. The results revealed that Bio 9637 (G_3) and JKMH 4848 (G_2) are the best medium maturity maize genotypes under 50 x 20 cm spacing with 250:80:100 NPK kg/ha.

Keywords: Maize, genotypes, density, nutrient levels, growth and yield

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Introduction

Maize (*Zea mays* L.) is the most versatile crop grown in almost all parts of India after rice and wheat. It has the highest yield potential and used as human food, animal feed and as a source of large number of industrial by-products. Recently, the demand and production is increasing owing to multivarious usage [1]. The genetic makeup, environmental and edaphic factors decide the yield potential of maize. Nevertheless, the genetic potential can be exploited to the maximum by providing conducive environment for growth and development as the yield is the result of the interaction of genotype, management and environmental factors.

Technological interventions *viz*., genotypes, planting density, water and nutrient management and pest and disease management etc. influence the yield of crops to a greater extent. The responses to these interventions vary across environments. Amongst, genotypes, planting density and nutrient management play a vital role in increasing the yield of maize. Maintenance of optimum plant population favour desirable yield as it is one of the major causes which directly affect the yield. Being an exhaustive nature, it requires more quantities of nutrients during different growth periods. This necessitates balanced application of nitrogen, phosphorus and potassic fertilizers for improving the productivity and their contribution is 40 - 45 per cent. [2]. Hence, the present experimentation was conducted to study the response of pre release medium maturity maize genotypes to different planting density and NPK levels with their interactions.

Materials and Methods

Field experiment was conducted in sandy clay loam soil at Department of Millets, Tamil Nadu Agricultural University, Coimbatore during *Kharif*, 2016 to study the effect of varying planting density and nutrient levels on pre release medium maturity maize genotypes with their interactions. The soil was low in available N and P and high in available K. The experiment was laid out in a split – split plot design. In the main plot, two planting densities *viz*., D_1- 60 x 20 cm and D_2 - 50 x 20 cm and in the sub plot, two nutrient levels *viz*., N_1: 200:65:80 NPK kg/ha and N_2: 250:80:100 NPK kg/ha and in the sub sub plot, five genotypes *viz*., G_1: JH 31605, G_2: JKMH 4848, G_3: Bio 9637, G_4: HM9 and G_5: PMH4 were tried in three replications. Observations on plant height, yield attributes and yield were recorded.

Results and Discussion

Effect of planting density and nutrient levels on growth, yield attributes and yield of pre release medium maturity maize genotypes

Experimental results revealed that planting densities and nutrient levels failed to exert significant influence on growth and yield attributes of genotypes. The interaction effect was not significant. Nevertheless, among the planting densities, higher plant height was recorded in D_2 (193.4 cm). This might be due to increased competition for space, sunlight and available nutrients which favoured higher plant height. The results are in conformity with the findings of Pal and Bhatnagar (2012) [3].With respect to nutrient levels, N_2 recorded higher plant height of 194.7 cm. This might

be due to prolonged vegetative growth which increased the plant height. These results are in agreement with those of Javed *et al*., 1985, Bakht *et al*., 1989, Masood *et al*., 2011 [4-6] who reported that plant height increased with increase in NPK levels. In respect of genotypes, Bio 9637 (G_3) registered higher plant height (210.8 cm) at harvest and it was comparable with G_2 and G_1 but was superior to G_5 and G_4.This was ascribed to the genetic makeup of plants (**Table 1**and **Figure 1**).

Table 1 Effect of planting density and nutrient levels on growth, yield attributes and yields of pre release medium maturity maize genotypes

Treatments	Plant height (cm) at harvest	Cob length (cm)	Cob girth (cm)	No.of grain rows/cob	No. of grains/ row	100 seed weight (g)	Grain yield ($kgha^{-1}$)
Main plot							
D_1	191.3	17.5	14.2	15.0	37.2	37.2	6272
D_2	193.4	17.2	13.7	14.3	36.3	36.6	6810
SEd	10.2	0.82	0.58	0.41	0.62	0.50	208
CD (p=0.05)	NS	NS	NS	NS	NS	NS	NS
Sub plot							
N_1	190.0	17.0	13.8	14.5	36.5	36.7	6378
N_2	194.7	17.6	14.1	14.8	37.0	37.1	6704
SEd	2.34	0.29	0.39	0.20	0.45	0.95	173
CD (p=0.05)	NS	NS	NS	NS	NS	NS	NS
Sub sub plot							
G_1	193.2	17.4	14.0	14.7	36.9	37.1	6553
G_2	202.8	17.8	14.3	15.0	37.4	37.7	7154
G_3	210.8	18.1	14.5	15.3	37.8	38.2	7733
G_4	174.3	16.5	13.4	14.1	35.5	35.5	5363
G_5	180.7	16.8	13.6	14.3	36.2	36.1	5903
SEd	9.76	0.72	0.61	0.50	0.78	1.76	321
CD (p=0.05)	19.9	NS	NS	NS	NS	NS	653

Growth and yield of maize as influenced by $D_1N_1G_3$

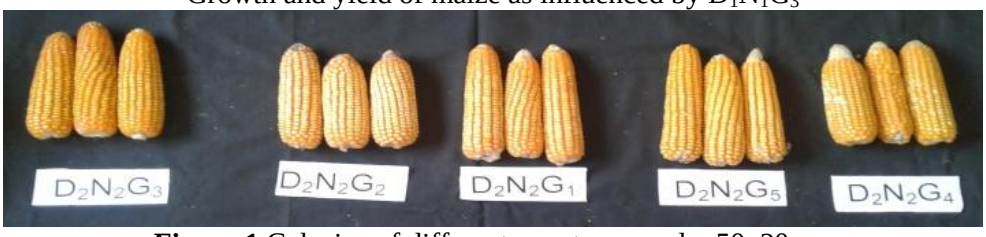

Figure 1 Cob size of different genotypes under 50x20 cm

Effect of planting density and nutrient levels on economics of pre release medium maturity maize genotypes

Among planting densities, 60 x 20 cm (D_1) registered higher cob length (17.5 cm), cob girth (14.2 cm), no. of grain rows/cob (15.0), no. of grains/row (37.2) and 100 seed weight (37.2 g). This was due to better availability of light, aeration and nutrients than 50cm x 20cm.Similar view has been expressed by Bangarwa *et al*. (1988) and Lashkari et al. (2011) [7, 8]. With regard to nutrient levels, N_2 recorded higher cob length (17.6 cm), cob girth (14.1 cm), no. of grain rows/cob (14.8), no. of grains/row (37.0) and 100 seed weight (37.1 g). This might be due to improved availability of nutrients favoured by increased levels of fertilizer. The results are in accordance with the findings of Ahmad, 1980 and Thakur *et al*., 1991. [9, 10]. The genotype G_3 (Bio 9637) recorded higher cob length (18.1 cm), cob girth (14.5 cm), no.of grain rows/cob (15.3), no. of grains/row (37.8) and 100 seed weight (38.2 g). There was no significant influence of planting densities and nutrient levels on grain yield. Nevertheless, D_2 and N_2 recorded higher grain yield of 6810 kg $ha^{-1}$and 6704 kg ha^{-1}, respectively. With respect to genotypes, Bio 9637 (G_3) registered higher grain yield of 7733 kg $ha^{-1}$and it was comparable with JKMH 4848 (G_2) but was superior to G_1, G_5 and G_4. This was ascribed to genetic makeup of plants coupled with improved nutrient uptake under high nutrient status (**Table 2**).

In respect of economics, Bio 9637 (G_3) under 50 x 20 cm spacing with 250:80:100 NPK kg/ha registered the highest net return (Rs. 82,529/ha) and BC ratio (2.56).This was followed by JKMH 4848 (G_2) which registered a net return of Rs. 72411/ha with a B: C ratio of 2.37.The lowest net return (Rs. 41,087/ha) and B: C ratio (1.78) was registered in HM9 (G_4).

Table 2 Effect of planting density and nutrient levels on economics of pre release medium maturity maize genotypes

Treatments	Net return (Rs.ha^{-1})	B:C ratio
$D_1N_1G_1$	52108	2.07
$D_1N_1G_2$	61341	2.27
$D_1N_1G_3$	70241	2.45
$D_1N_1G_4$	33843	1.70
$D_1N_1G_5$	42125	1.87
$D_1N_2G_1$	55884	2.12
$D_1N_2G_2$	65628	2.31
$D_1N_2G_3$	74945	2.50
$D_1N_2G_4$	36664	1.73
$D_1N_2G_5$	45420	1.91
$D_2N_1G_1$	57905	2.13
$D_2N_1G_2$	67931	2.33
$D_2N_1G_3$	77573	2.52
$D_2N_1G_4$	38101	1.75
$D_2N_1G_5$	47099	1.92
$D_2N_2G_1$	61912	2.17
$D_2N_2G_2$	72411	2.37
$D_2N_2G_3$	82529	2.56
$D_2N_2G_4$	41087	1.78
$D_2N_2G_5$	50500	1.96

Conclusion

From the experimental results, it could be concluded that Bio 9637 (G_3) and JKMH 4848 (G_2) are the best medium maturity maize genotypes under 50 x 20 cm spacing with 250:80:100 NPK kg/ha.

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