Response of pre-release late maturity maize hybrids under varying planting density and nutrient levels in kharif season

AP SIVAMURUGAN and R RAVIKESAVAN

Department of Millets, Tamil Nadu Agricultural University, Coimbatore 641003 Tamil Nadu, India
Email for correspondence: apacsivamurugan@gmail.com

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ABSTRACT

Field experiment was carried out at the Department of Millets, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu during kharif 2019 to study the response of pre-release late maturity maize hybrids to different planting densities and NPK levels and their interactions. The experiment was laid out in a split-split plot design. In the main plot two planting densities viz D_1: 60 cm x 25 cm and D_2: 60 cm x 20 cm and in the sub-plot, two nutrient levels viz N_1: 100 per cent RDF (200:65:80 NPK kg/ha) and N_2: 150 per cent RDF (300:97.5:120 NPK kg/ha) and in the sub-sub-plot, two hybrids viz G_1: ADV 1390064 and G_2: CMH 08-287 were tried. Based on the results of two years of experimentation, it was concluded that among the late maturity maize hybrids, G_1 (ADV 1390064) was found to be the promising hybrid under 60 cm x 20 cm spacing with 100 per cent RDF (200:65:80 NPK kg/ha) which recorded higher grain yield (9,595 kg/ha), net return (Rs 94,704/ha) and B-C ratio (2.51).

Keywords: Late maturity; maize hybrids; planting density; nutrient level; yield

INTRODUCTION

Maize is an important cereal crop grown in most parts of India due to its wide adaptability. Late maturity maize hybrids have higher yielding potential than medium and early maturity hybrids. The yield potential depends on its genetic makeup and environmental and edaphic factors. Therefore these hybrids have to be exploited to achieve higher yield through adoption of improved agro-techniques.

The productivity of maize in India is low as compared to average productivity of the world. This is mainly due to conventional varieties grown by the farmers which evince poor response to applied fertilizers, frequent occurrence of drought, maintenance of poor plant stand, poor soil fertility, resurgence of pest and diseases etc. The maintenance of optimum plant population and balanced application of manures and fertilizers is highly essential for obtaining desirable yield as it directly depends on number of plants per unit area (Ahmadi et al 1993) and soil available nutrients (Derbay et al 2004). Plant density influences yield attributes of maize viz number of cobs per plant, number of grains per grain row, number of grain rows per cob and cob weight through competition for resources like space, water, light, nutrients etc (Dawadi and Sah 2012). Keeping in view the above facts, the present experiment was conducted to study the response of pre-release late maturity maize hybrids to different planting densities and NPK levels and their interactions.

MATERIAL and METHODS

Field experiment was carried out at the Department of Millets, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu during kharif 2019 to study the response of pre-release late maturity maize hybrids to different planting densities and NPK levels and their interactions. The experiment was laid out in a split-split plot design. In the main plot, two planting densities viz D_1: 60 cm x 25 cm and D_2: 60 cm x 20 cm, in the sub-plot, two nutrient levels viz N_1: 100 per cent RDF (200:65:80 NPK kg/ha) and N_2: 150 per cent RDF (300:97.5:120 NPK kg/ha) and in the sub-sub-plot, two hybrids viz G_1: ADV 1390064 and G_2: CMH 08-287 were tried in three replications. Observations on plant height at harvest, yield attributes viz cob length, cob girth, number of grains/cob, number of grain rows/

cob, 100-seed weight and grain and stover yield were recorded.

RESULTS and DISCUSSION

Response of pre-release late maturity maize hybrids to different planting densities and NPK levels (Table 1)

Experimental results revealed that D_2 (60 cm x 20 cm) recorded higher plant height of 231.5 cm than D_1 (60 cm x 25 cm). This could be due to competition for resources which increased plant height (Ahmadi et al 1993). With respect to nutrient levels, N_2: 150 per cent RDF (300:97.5:120 NPK kg/ha) recorded higher plant height of 232.9 cm which was higher than N_1: 100 per cent RDF (200:65:80 NPK kg/ha). This might be due to supply of adequate quantity of nutrients during vegetative phase of the crop. The results corroborate with the findings of Sharifi and Namvar (2016). Among the late maturity maize hybrids, G_2 (CMH 08-287) recorded higher plant height of 246.3 cm which was superior to G_1 (ADV 1390064). This might be due to genetic makeup of the hybrid.

Though D_1 (60 cm x 25 cm) spacing recorded higher cob length of 21.9 cm. This might be due to favourable environment and more availability of resources in D_2 than D_1. The results are similar to the findings of Golla et al (2018). Nutrient levels also did not evince any significant influence on cob length. Nevertheless N_2 (150 per cent RDF) recorded higher cob length of 22.2 cm. This could be due to increased availability of nutrients to the crop which favoured the cob length. The results are in line with the findings of Zamir et al (2011). Among the late maturity maize hybrids, G_1 (ADV 1390064) recorded higher cob length than G_2 (CMH 08-287). There was no significant influence of planting densities, fertilizer levels and hybrids on cob girth.

Number of grains/row was not significantly influenced by planting densities and nutrient levels. However D_1 (60 cm x 25 cm) and N_2 (150 per cent RDF) recorded higher number of grains/row of 38.4 and 38.2 respectively. This can be ascribed to increased cob length and girth. The results are in agreement with the findings of Sharifi and Namvar (2016). Among the late maturity maize hybrids, G_1 (ADV 1390064) recorded higher number of grains/row of 38.8 which was higher than G_2 (CMH 08-287). Planting densities and nutrient levels had significant influence on 100-seed weight. However D_1 (60 cm x 25 cm) and N_2 (150 per cent RDF) recorded higher 100-seed weight of 44.2 and 44.4 g respectively. In respect of hybrids, G_2 (CMH 08-287) recorded higher 100-seed weight of 45.3 g which was higher than G_1 (ADV 1390064). Similar observations were made by Karki (2002). The interaction effect was found to be non-significant.

Planting densities and nutrient levels exerted significant influence on grain yield. However D_2 (60 cm x 20 cm) recorded higher grain yield of 9,293 kg/ha which was more than D_1 (60 cm x 25 cm). The increase in grain yield could be due to effective utilization of resources by more plant population. The results are similar to the findings of Aziz et al (2007) who reported 25 per cent more grain yield obtained under high density compared to low density. In respect of nutrient levels, N_2 (150 per cent RDF) recorded higher grain yield of 9,166 kg/ha which was higher than N_1 (100 per cent RDF). This might be due to improved yield attributes favoured by increasing level of fertilizers. The results are in conformity with the findings of Karki (2002) and Gungula et al (2003). Among the late maturity maize hybrids, G_1 (ADV 1390064) recorded higher grain yield of 9,384 kg/ha which was significantly superior to G_2 (CMH 08-287). This could be due to better yield attributes obtained through improved photosynthetic rate of the crop. The results are in agreement with the findings of Shapiro and Wortmann (2006) and Shanti et al (1997).

D_2 (60 cm x 20 cm) recorded higher grain yield of 14,880 kg/ha which was superior to D_1 (60 cm x 25 cm). This might be due to more plant population per unit area. The results are in accordance with the findings of Haque et al (2001) and Majid et al (2017). With respect to nutrient levels, N_2 (150 per cent RDF) recorded higher stover yield of 14,724 kg/ha which was higher than N_1 (100 per cent RDF) which could be due to increased supply of NPK which favoured the nutrient uptake consequently the stover yield. The results are in confirmation to the the findings of Onasanya et al (2009). G_2 (CMH 08-287) recorded higher stover yield of 15,177 kg/ha which was significantly superior to G_1 (ADV 1390064). The interaction was not significant.

Yield and economics of pre-release late maturity hybrids as influenced by planting densities and NPK levels (Table 2)

Among the maize genotypes, G_1 (ADV 1390064) recorded higher grain yield of 9,981 kg/ha under 60 cm x 20 cm spacing with 150 per cent RDF

closely followed by the same hybrid under 60 cm x 20 cm spacing with 100 per cent RDF which recorded a grain yield of 9,595 kg/ha. The lowest yield of 7,758 kg/ha was recorded by G_2 (CMH 08-287) under 60 cm x 25 cm spacing with 100 per cent RDF. Thus G_1 (ADV 1390064) registered higher net return of Rs 94,704/ha with a B-C ratio of 2.51.

CONCLUSION

Based on the results of experimentation it is concluded that among the late maturity maize hybrids, G_1 (ADV 1390064) was found to be the promising hybrid under 60 cm x 20 cm spacing with 100 per cent RDF (200:65:80 NPK kg/ha) which recorded higher grain yield (9,595 kg/ha), net return (Rs 94,704/ha) and B-C ratio (2.51).

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

Treatment	Plant height (cm)	Cob length (cm)	Cob girth (cm)	Number of grains/row	Number of grain rows/cob	100-seed weight (g)	Grain yield (kg/ha)	Stover yield (kg/ha)
Main plot								
D_1	219.1	21.9	15.9	38.4	14.3	44.2	8,526	13,762
D_2	231.5	21.6	15.8	35.6	14.3	42.7	9,293	14,880
$CD_{0.05}$	2.3	0.7	NS	2.1	NS	NS	0.212	0.882
Sub-plot								
N_1	227.6	21.4	15.5	36.8	14.1	40.7	8,653	13,918
N_2	232.9	22.2	16.2	38.2	14.5	44.4	9,166	14,724
$CD_{0.05}$	3.4	1.1	NS	0.8	NS	0.7	0.311	0.417
Sub-sub-plot								
G_1	214.3	22.1	15.9	38.8	14.4	42.8	9,384	13,465
G_2	246.3	19.4	15.8	36.3	14.2	45.3	8,435	15,177
$CD_{0.05}$	9.4	1.2	NS	0.7	NS	2.6	714	1,020

D_1= 60 cm x 25 cm, D_2= 60 cm x 20 cm; N_1= 100% RDF (200:65:80 NPK kg/ha), N_2= 150% RDF (300:97.5:120 NPK kg/ha); G_1= ADV 1390064, G_2= CMH 08-287

Table 2. Yield and economics of pre-release late maturity hybrids as influenced by planting density and NPK levels

Treatment	Grain yield (kg/ha)	Net return (Rs/ha)	B-C ratio
$D_1N_1G_1$	8,803	84,898	2.42
$D_1N_1G_2$	7,758	71,016	2.19
$D_1N_2G_1$	9,157	87,758	2.39
$D_1N_2G_2$	8,386	77,542	2.23
$D_2N_1G_1$	9,595	94,704	2.51
$D_2N_1G_2$	8,456	79,769	2.27
$D_2N_2G_1$	9,981	98,141	2.48
$D_2N_2G_2$	9,141	87,102	2.32

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