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SHORT COMMUNICATION

PERFORMANCE OF MEDIUM MATURING MAIZE HYBRIDS UNDER HARYANA AGRO-CLIMATIC CONDITIONS

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SUMMARY

In the present study, 15 maize hybrids were evaluated at two locations viz., RDS Seed Farm, CCSHAU, Hisar and CCSHAU RRS, Karnal during **kharif** 2014 with the objective to know the performance of newly developed medium maturing maize hybrids under prevailing Haryana agro-climatic conditions. The analysis of variance revealed significant differences among the genotypes for different characters. In environment I, JKMH 4545 (6776 kg/ha) was at the top followed by PMH 4 (Check) (6429 kg/ha), DKC 9144 (6386 kg/ha) and CMH 10-547 (6356 kg/ha). In environment II, HM 4 (Check) (10546 kg/ha) was top yielder followed by hybrid AQH 4 (10260 kg/ha), HM 10 (Check) (9965 kg/ha) and DKC 9145 (9956 kg/ha). But, on pooled basis, DKC 9145 with an average yield of 7979.5 kg/ha was at the top followed by HM 4 (Check) (7908 kg/ha), JKMH 4545 (7745.5 kg/ha) and DKC 9144 (7728 kg/ha).

Key words : Yield performance, medium maturity, maize, hybrids

Maize (*Zea mays* L.) is the third most important crop after wheat and rice. In India maize is cultivated in 855 mha with a production of 21.7 m ton and the average yield is 251 t/ha (Singh *et al.,* 2014). It is an important crop cultivated for human food, animal feed and fodder and also utilized as a raw material for large number of industrial products. In India, it is grown as a dual purpose crop for grain as well as fodder. It is one of the most versatile crop having wide adaptability under varied agro-climatic conditions (Sharma *et al.,* 2014). Maize, being a C_4 plant, has the maximum potential of per day carbohydrate productivity (Dayal *et al*., 2014). Its plants are quick growing, succulent, sweet, palatable, high yielding, nutritious and free from toxicants and used safely for animals at any stage of crop growth. The kernels of maize are rich in starch, protein, fat, vitamins and mineral nutrients.

It is highly cross pollinated crop. Therefore, OPV, composite/synthetic varieties and hybrids are used for commercial cultivation. But, the maximum yield potential is invested only in hybrid cultivars. Therefore, more emphasis is always given on the development and evaluation of maize hybrids rather than the varieties. Keeping the discussion in view, there is a need to evaluate maize hybrids for their production performance under prevailing Haryana agro-climatic conditions.

The experiment was conducted at two locations in Haryana viz., RDS Seed Farm, Beed Babran, CCSHAU, Hisar (environment-I) and CCSHAU RRS Uchani, Karnal (environment-II) during **kharif** 2014 with the objective to evaluate the performance of newly developed medium maturing maize hybrids (Table 1) under prevailing Haryana agro-climatic conditions. Haryana is the part of Indo-Gangatic alluvial plains, a tectonic basic with covering alluvial deposits brought down during Pleistocene age. The RDS Seed Farm lies at 29°47′ N latitude and 75°47′ E longitude in the west of Hisar-Barwala road with loamy sand (Type Haplusteptsis) soil. The RRS, Uchani, Karnal research area lies at 29°42′ N latitude and 77°02′ longitude in the east of Karnal-Chandigarh road with midly alkaline sandy loam (Type Ustrochrept) soil. The experimental material was comprised of 15 medium maturing maize hybrids including five checks, which was received from IIMR, New Delhi. The experiment was laid out in randomized block design with three replications having plot size of 4 x 3 m^2 with row to row and plant to plant spacing of 75 and 15 cm, respectively. Data were recorded for plant height (cm), fodder yield (kg/ha), grain yield (kg/ha), plant stand at harvest, days to 50 per cent pollen shedding, days to 50 per cent silking, days to 75 per cent husk drying and ear placement height (cm). The data

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TABLE 1
Maize hybrids used in present study

S. No.	Hybrids	Source
1.	AQH4	IARI Delhi
2.	CMH 10-547	TNAU
3.	DKC 9144	Monsanto India Ltd.
4.	DKC 9149	Monsanto India Ltd.
5.	FCH 11231	Foliage
6.	JKMH 4545	J. K. Seed
7.	S-6750	Syngenta India Ltd.
8.	TH-38	Yaaganti Seeds
9.	DKC9145	Monsanto India Ltd.
10.	RASI-3033	Rasi Seed Pvt Ltd.
11.	PMH 4 (Check)	PAU, Ludhiana
12.	HM 9 (Check)	HAU, Hisar
13.	HM 10 (Check)	HAU, Hisar
14.	BIO-9637 (Check)	Bio seeds
15.	HM4 (Check)	HAU, Hisar

recorded were analyzed for mean, coefficient of variation and critical difference by OPSTAT.

In the present study, the results obtained from the analysis of variance revealed significant differences among the different maize hybrids for different characters.

Grain Yield

The mean performance (Table 2) indicated that in environment-I, JKMH 4545 (6776 kg/ha) was at the top followed by PMH 4 (Check) (6429 kg/ha), DKC 9144 (6386 kg/ha), CMH 10-547 (6356 kg/ha), S-6750 (6256 kg/ha), TH-38 (6198 kg/ha), BIO-9637 (6060 kg/ha), FCH 11231 (6039 kg/ha), DKC9145 (6003 kg/ha), HM 9 (5904 kg/ha), DKC 9149 (5618 kg/ha), HM 10 (5485 kg/ha), HM 4 (5270 kg/ha), RASI-3033 (5059 kg/ha) and AQH 4 (4849 kg/ha). In environment-II, HM 4 (Check) (10546 kg/ha) was top yielder followed by hybrid AQH 4 (10260 kg/ha), HM 10 (Check) (9965 kg/ha), DKC 9145 (9956 kg/ha), DKC 9149 (9333 kg/ha), TH-38 (9198 kg/ha), CMH 10-547 (9074 kg/ha), DKC 9144 (9070 kg/ha), PMH 4 (8993 kg/ha), FCH 11231 (8881 kg/ha), JKMH 4545 (8715 kg/ha), S-6750 (8673 kg/ha), HM 9 (7940 kg/ha), BIO-9637 (7888 kg/ha) and RASI-3033 (7839 kg/ha). But, on pooled basis, DKC 9145 with an average yield of 7979.5 kg/ha was at the top followed by HM 4 (Check) (7908 kg/ha), JKMH 4545 (7745.5 kg/ha), DKC 9144 (7728 kg/ha), HM 10 (Check) (7725 kg/ha), CMH 10-547 (7715 kg/ha), PMH 4 (Check) (7711 kg/ha), TH-38 (7698 kg/ha), AQH 4 (7554.5 kg/ha), DKC 9149 (7475.5 kg/ha), S-6750 (7464.5 kg/ha), FCH 11231 (7460 kg/ha), BIO-9637 (Check) (6974 kg/ha), HM 9 (Check) (6922 kg/ha) and RASI-3033 (6449 kg/ha). Similar findings were also reported in maize by Dhaka *et al*. (2014) and Suthar *et al*. (2014).

Grain Shelling (%)

In environment-I, grain shelling (%) was maximum for FCH 11231 (69.6%) followed by HM 9 (69.2%), TH-38 (69.3%) DKC 9144 (69.2%), CMH 10-54 (69.1%), PMH 4 (68.5%), JKMH 4545 (68.1%) but, lowest was in BIO-9637 (67.1%). In environment-II, grain shelling (%) was maximum for AQH 4 (68.9%) followed by DKC 9144 (68.2%), DKC 9149 (68.2%), HM 9 (67.8%), S-6750 (67.7%), HM 4 (67.7%) and HM 10 (67.5%). Lowest grain shelling (%) was found in JKMH 4545 (65.0%). But, on pooled basis, grain shelling (%) was maximum for DKC 9144 (68.9%) followed by HM 9 (68.65%), TH-38 (68.35), AQH 4 (68.05%), CMH 10-547 (68.05%), DKH 9149 (68.05%) and FCH 11231 (68.0). While the lowest grain shelling (%) was found in BIO-9637 (66.25%).

Plant Stand

Considering the average plant stand from Table 2 that in environment-I, it was observed that the maximum plant stand was in JKMH 4545 (63.0) followed by HM 9 (63.0), DKC 9149 (62.6), TH-38 (61.7), PMH 4 (60.9), BIO-9637 (61.5), S-6750 (60.4) and DKC 145 (60.4). In environment-II, maximum plant stand was in TH-38 (62.6) followed by RASI-3033 (62.6), DKC 9145 (62.0), PMH 4 (61.9), S-6750 (61.7), HM 10 (61.7), DKC 9149 (61.5) and DKC 9144 (61.3). But, on pooled basis, maximum plant stand was in TH-38 (62.15) followed by DKC 9149 (62.05), JKMH 4545 (62.05), HM 9 (61.7), PHM 4 (61.4), DKC 145 (61.2), BIO-9637 (61.7) and S-6750 (61.05).

Days to 50 per cent Pollen Shedding

In environment-I, it was observed that hybrids JKMH 4545 (50.3%), AQH 4 (50.7%), DKC 9144 (51.0%) and BIO-9637 (51.3%) were early in pollen shedding. However, RASI-3033 (55.0%), HM 4 (54.2%), FCH 11231 (54.3%) and TH-38 (53.3%) were late in pollen shedding in environment-I. Likewise, in environment-II, AQH 4 (47.3%), PMH 4 (47.7%), RASI-

TABLE 2
Performance of medium maturing maize hybrids under Haryana agro-climatic conditions

Hybrids	Grain yield (kg/ha)			Grain shelling (%)			Plant stand			Days to 50% pollen shed		
	Hisar	Karnal	Pooled	Hisar	Karnal	Pooled	Hisar	Karnal	Pooled	Hisar	Karnal	Pooled
AQH 4	4849.0	10260.0	7554.5	67.2	68.9	68.05	60.0	60.4	60.2	50.7	47.3	49.0
CMH 10-547	6356.0	9074.0	7715.0	69.1	67.0	68.05	59.1	60.9	60.0	52.0	51.0	51.5
DKC 9144	6386.0	9070.0	7728.0	69.2	68.6	68.9	58.3	61.3	59.8	51.0	48.7	49.85
DKC 9149	5618.0	9333.0	7475.5	67.9	68.2	68.05	62.6	61.5	62.05	52.3	53.7	53.0
FCH 11231	6039.0	8881.0	7460.0	69.6	66.4	68.0	58.3	60.7	59.5	54.3	51.7	53.0
JKMH 4545	6776.0	8715.0	7745.5	68.1	65.0	66.55	63.0	61.1	62.05	50.3	50.0	50.15
S-6750	6256.0	8673.0	7464.5	67.1	67.7	67.4	60.4	61.7	61.05	51.3	52.7	52.0
TH-38	6198.0	9198.0	7698.0	69.3	67.4	68.35	61.7	62.6	62.15	53.3	52.7	53.0
DKC 9145	6003.0	9956.0	7979.5	67.9	67.2	67.55	60.4	62.0	61.2	52.3	52.0	52.15
RASI-3033	5059.0	7839.0	6449.0	68.1	65.2	66.65	56.1	62.6	59.35	55.0	48.0	51.5
PMH 4 (Check)	6429.0	8993.0	7711.0	68.5	65.9	67.2	60.9	61.9	61.4	51.3	47.7	49.5
HM 9 (Check)	5904.0	7940.0	6922.0	69.5	67.8	68.65	63.0	60.4	61.7	51.3	50.7	51.0
HM 10 (Check)	5485.0	9965.0	7725.0	67.7	67.5	67.6	58.5	61.7	60.1	53.3	53.3	53.3
BIO-9637 (Check)	6060.0	7888.0	6974.0	67.1	65.4	66.25	61.5	60.9	61.2	51.3	52.3	51.8
HM 4 (Check)	5270.0	10546.0	7908.0	68.1	67.7	67.9	54.8	60.6	57.7	54.7	53.3	54.0
Mean	5913.0	9089.0	7501.0	68.3	67.1	67.7	59.9	61.3	60.6	52.3	51.0	51.65
C. D. (P=0.05)	1250.0	304.0	777.0	1.71	0.23	0.97	5.74	2.04	3.89	1.92	1.15	1.535
C. V. (%)	12.62	2.0	7.31	1.49	0.2	0.845	4.73	1.99	3.36	2.19	1.35	1.77

Table 2 contd. *Contd.*

Hybrids	Days to 50% silking			Days to 75% dry husk			Plant height (cm)			Ear placement height		
	Hisar	Karnal	Pooled	Hisar	Karnal	Pooled	Hisar	Karnal	Pooled	Hisar	Karnal	Pooled
AQH4	53.0	49.3	51.15	90.7	97.3	94.00	171.5	173.3	172.4	77.3	73.3	75.30
CMH 10-547	54.7	53.0	53.85	93.7	96.0	94.85	226.8	196.7	211.75	98.3	90.0	94.15
DKC 9144	53.3	50.7	52.00	94.7	97.3	96.00	209.3	200.0	204.65	403.5	105.0	254.25
DKC 9149	55.0	55.7	55.35	95.0	98.7	96.85	188.7	211.7	200.2	77.2	110.0	93.60
FCH 11231	56.7	53.7	55.20	92.7	96.7	94.70	234.9	218.3	226.6	100.3	101.7	101.00
JKMH 4545	52.7	51.0	51.85	89.3	96.7	93.00	218.1	180.0	199.05	94.4	78.3	86.35
S-6750	54.3	54.7	54.50	96.0	98.7	97.35	194.5	190.0	192.25	80.8	90.0	85.40
TH-38	56.0	53.7	54.85	96.0	106.0	101.00	200.3	200.0	200.15	93.9	110.0	101.95
DKC9145	55.0	54.0	54.50	94.0	96.3	95.15	206.9	213.3	210.1	94.5	118.3	106.4
RASI-3033	58.0	50.0	54.00	94.0	102.7	98.35	175.3	171.7	173.5	71.5	81.7	76.60
PMH 4 (Check)	54.3	49.7	52.00	91.0	96.3	93.65	194.5	178.3	186.4	82.2	98.3	90.25
HM 9 (Check)	53.7	52.7	53.20	90.0	97.3	93.65	193.7	156.7	175.2	83.8	76.7	80.25
HM 10 (Check)	55.3	55.3	55.30	97.0	107.7	102.35	229.1	181.7	205.4	98.8	91.7	95.25
BIO-9637 (Check)	54.0	54.3	54.15	92.0	96.7	94.35	225.1	200.0	212.55	91.2	90.0	90.60
HM 4 (Check)	56.3	55.3	55.80	91.0	95.3	93.15	169.3	151.7	160.5	63.9	71.7	67.80
Mean	54.8	52.9	53.85	93.2	98.6	95.90	202.6	188.2	195.4	87.5	92.4	89.95
C. D. (P=0.05)	1.99	1.15	1.57	2.65	4.4	3.525	22.2	6.94	14.57	13.46	7.97	10.715
C. V. (%)	2.17	1.30	1.735	1.7	2.66	2.18	6.55	2.2	4.375	9.21	5.15	7.18

3033 (48.0%) and DKC 9144 (48.7%) were early in pollen shedding. However, DKC 9149 (53.7), HM 10 (53.3), HM 4 (53.3) and S-6750 (52.7%) were late in pollen shedding. But, on pooled basis, AQH 4 (49.0%), PMH 4 (49.5%), DKC 9144 (49.85%) and JKMH 4545 (50.15%) were early in pollen shedding. However, HM 4 (54.0%), HM 10 (53.3%), DKC 9149 (53.0%), FCH 11231 (53.0%) and TH-38 (53.0%). Similar findings were also reported in maize by Dhaka *et al*. (2014).

Days to 50 per cent Silking

It is revealed from the Table 2 that in environment-I, JKML 4545 (52.7%), DKC 9144 (53.3%) and HM 9 (53.7%) were early in silking. However, RASI-3033 (58.0%), FCH 11231 (56.7%), HM 4 (56.3%) and TH-36 (56.0%) were late in silking. In environment-II, AQM 4 (49.3%), PMH4 (49.7%), RASI-3033 (50.0%) and DKC 9144 (50.7%) were early in silking. However, DKC 9149 (55.7%), HM 4 (55.3%), HM 10 (55.3%) and S-6750 (54.7%) were late in silking. But, on pooled basis, AQM 4 (51.15%), JKML 4545 (51.85%), DKC 9144 (52.0%) and PMH 4 (52.0%) were early in silking. However, were late in silking. Similar findings were also reported in maize by Dhaka *et al*. (2014).

Days to 75 per cent Husk Drying

An examination of data on days to 75% husk drying in environment-I, revealed that HM 9 (90.0), AQH 4 (90.7), PMH 4 (91.0) and HM 4 (91.0) were early in days to 75 per cnet husk drying. However, HM 10 (97.0), TH-38 (96.0), S-6750 (96.0) and DKC 9149 (95.0) were late in 75 per cent husk drying. In environment-II, HM 4 (95.3), CMH 10-547 (96.0), DKC 145 (96.3) and PMH 4 (96.3), were early in days to 75 per cent husk drying. However, HM 10 (107.7), TH-38 (106.0), RASI-3033 (102.7) and DKC 9149 (98.7) were late in 75 per cent husk drying. But, on pooled basis, JKMH 4545 (93.0), HM 4 (93.15), PMH 4 (93.65) and HM 9 (93.65) were early in days to 75 per cent husk drying. However, HM 10 (102.35), TH-38 (101.0), RASI (98.35) and S-6750 (97.35) were late in 75 per cent husk drying.

Plant Height

The mean performance (Table 2) indicated that in environment-I, HM 4 (169.3), AQH 4 (171.5), RASI-3033 (175.3) and DKC 9149 (188.7) were short in stature. However, FCH 11231 (234.9), HM 10 (229.1), CMH 10-547 (226.8) and BIO-9637 (225.1) were tall in plant height. Likewise, in environment-II, HM 4 (151.7), HM 9 (156.7), RASI-3033 (171.7) and AQH (173.3) were short in stature. However, FCH 11231 (218.3), DKC 9145 (213.3), DKC 9148 (211.7), DKC 9144 (200.0), TH-38 (200.0) and BIO-9637 (200.0) were tall in plant height. But, on pooled basis, HM 4 (160.5), AQH 4 (172.4), RASI-3033 (173.5) and HM 9 (175.2) were short in stature. However, BIO-9637 (212.55), CMH 10-547 (211.75), TH-38 (200.15), HM 10 (205.4) and DKC 9144 (204.65) were tall in plant height. Similar finding were also reported in maize by Dhaka *et al*. (2014) and Suthar *et al*. (2012, 2014).

Ear Placement Height

The perusal of results on mean performance revealed that in environment-I, ear placement height was high for DKC 9144 (103.5), FCH 11231 (100.3), HM 10 (98.8), CMH 10-547, DKC9145 (94.5), JKMH 4545 (94.4), TH-38 (93.9) and BIO-9637 (91.2). Likewise, in environment-II, ear placement height was high for DKC 9145 (118.3), DKC 9149 (110.0), TH-38 (110.0), DKC 9144 (105.0), FCH 11231 (101.7), PMH 4 (98.3) and HM 10 (91.7). Moreover, on pooled basis, ear placement height was high for DKC 9145 (106.4), DKC 9144 (104.25), TH-38 (101.95), FCH 11231 (101.0), HM 10 (95.25), CMH 10-547 (94.15) and DKC 9149 (93.6).

Fodder Yield

An examination of the fodder yield (Fig. 1) was highest of hybrid TH-38 (234.9 g/plant) followed by BIO-9637 (Check) (229.1 g/plant), HM 10 (Check) (226.8 g/plant), CMH 10-547 (225.1 g/plant), AQH 4 (218.1 g/plant), S-6750 (209.3 g/plant), PMH 4 (Check) (206.9 g/plant), RASI-3033 (200.3 g/plant), DKC 9144 (194.5 g/plant), HM 9 (Check) (194.5 g/plant), DKC 9149 (193.7 g/plant), JKMH 4545(188.7 g/plant), DKC 9145 (175.3 g/plant), FCH 11231(171.5 g/plant) and HM 4 (Check) (169.3 g/plant).

CONCLUSIONS

It was concluded from the present study that in environment-I, the hybrid JKMH 45454 was the

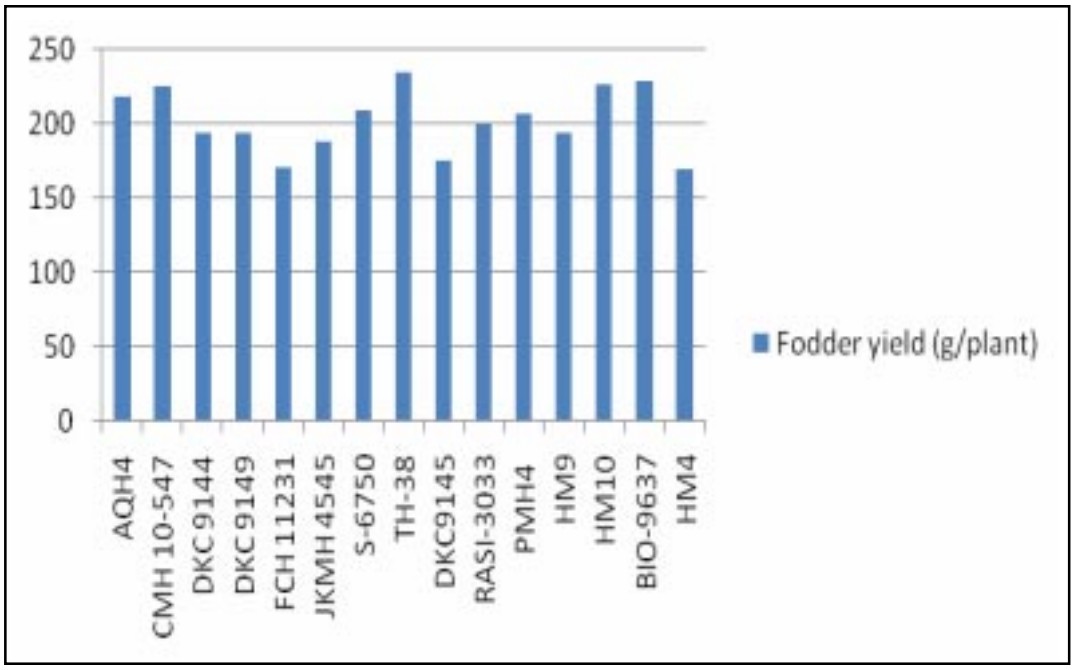

Fig. 1. Fodder yield of maize hybrids at Hisar.

highest in grain yield production. As it was early in days to 50 per cent pollen shedding and days to 50 per cent silking. Moreover, it was also good in crop plant stand as well as in grain shelling (%). All the maize hybrids produced more grain yield in environment-II, as it had more fertile soil and favourable environmental conditions. However, in environment-II none of the hybrids was superior to the HM-4 (Check). But on pooled basis DKC 9145 was top yielder.

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REFERENCES

Dayal, A., N. R. Rangare, Arun Kumar, and Mala Kumari. 2014 : Effect of physiological maturity of seed quality of maize (*Zea mays* L.). *Forage Res*., **40** : 1-6.

Dhaka, S. K., Dilip Singh, V. Nepalia, Sulochana, and J. Dhewa 2014 : Performance of sweet corn (*Zea mays* L. spp. saccharata) varieties at varying fertility levels. *Forage Res*., **40** : 195-198.

Sharma, M., Meenakshi Gupta, S. Kour, R. Bharat, and S. P. Singh. 2014 : Effect of sowing dates and varieties on productivity and economics of baby corn (*Zea mays*). *Har. J. Agron.*, **30** : 89-93.

Singh, M. V., Ved Prakash, B. Singh, and H. N. Shahi. 2014 : Response of maize hybrids to integrated nutrient management. *Har. J. Agron.* **30** : 65-69.

Suthar, M., D. Singh, and V. Nepalia. 2012 : Green fodder and cob yield of sweet corn [*Zea mays* (L.) spp. saccharata] varieties at varying fertility levels. *Forage Res*., **38** : 115-118.

Suthar, M., D. Singh, V. Nepalia, and A. K. Singh. 2014 : Performance of sweet corn (*Zea mays* L.) varieties at varying fertility levels. *Indian J. Agron*., **59** : 168-170.