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Evaluation of Spring Maize Hybrids under Irrigated Conditions

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A B S T R A C T

An investigation entitled "Evaluation of spring maize hybrids under irrigated conditions" was conducted at the instructional farm of Krishi Vigyan Kendra Langroya to check the yield potential of three maize hybrids during spring 2018 season. The experiment was laid out in randomized complete block design (RCBD) with six replications. All the crop management practices were followed as per the recommendations of Punjab Agricultural University, Ludhiana. The statistical analysis of data revealed that all the hybrids were non-significantly different with respect to maize cob weight, cob weight, grain: cob ratio, cob length, cob girth at base, middle and top. Numerically, P1844 resulted in highest value of maize cob weight, cob weight, grain: cob ratio, cob length, cob girth at base, middle and top in comparison to PMH 10 and DKC 9108. Maize hybrid P 1844 had significantly higher number of rows per cob (17.50) as compared to PMH 10 (14.67) but statistically at par with DKC 9108 (16.33). Other yield attributes *viz.,* shelling percentage, 100-seed weight was found to be non-significantly different. The significantly higher grain yield was recorded in P 1844 hybrid (85.46 q/ha) followed by DKC 9108 (69.55 q/ha) and PMH 10 (68.71 q/ha).

Introduction

In Punjab, maize crop is cultivated on an area of 1.16 lakh ha with production and productivity of 4.45 lakh tonne and 38.35 q/ha, respectively whereas in SBS Nagar district, it was cultivated on an area of 7,700 ha with production and productivity of 33,000 MT and 42.39 q/ha, respectively (Anon, 2018). Various biotic and abiotic factors affect the realization of better grain yield directly or indirectly. To tackle with these factors, agronomic and breeding approaches play a pivotal role. Breeding approach relies upon the development of superior cultivars which

can perform better relative to existing ones. Both public and private sectors have done consistent work in the development of maize hybrids *viz.,* PMH 10 of Punjab Agricultural University, Ludhiana; DKC 9108 of Monsanto seeds and P 1844 of Du Pont Pioneer. The performance of a particular hybrid/cultivar varies from one area to another which can be attributed to variation in the soil characteristics, existing weather conditions; availability of irrigation facilities etc. Sharma *et al.,* (2014) studied performance of different maize hybrids sown by the farmers in the Kapurthala district of Punjab and reported that the grain yield obtained varied between 70.0

to 100.8 q/ha. Similarly, Manan *et al.,* (2016) reported that the farmers were using fertilizers and pesticides without taking in to account recommendations made by different research institutes which has reduced the margin of profit day by day.

Keeping in view the above mentioned factors, an investigation was undertaken to evaluate the performance of three hybrids *viz.,* PMH 10, DKC 9108 and P 1844 under the irrigated conditions so that the farmers of the area can be guided properly.

Materials and Methods

The investigation was carried out at the instructional farm of Krishi Vigyan Kendra (KVK) Langroya. KVK Langroya is located in sub-tropical climatic regime with height of 247 m from mean sea level. The experiment was laid out in randomized complete block design (RCBD) with six replications. The gross and net plot size was 21.6 m^2 and 4.8 m^2, respectively. Pre-sowing irrigation was followed by preparation of fine seed bed with 3-4 ploughings. The sowing of crop was done during spring season on 20.02.2018 on the southern side of east-west direction ridges at 60×20 cm spacing with a seed rate of 25 kg/ha after seed treatment with Carbendazim @ 3 g and Gaucho @ 6 ml/kg seed, respectively. Fertilizers were applied as per recommendations by the Punjab Agricultural University, Ludhiana *i.e.,* urea @ 75 kg/ha, DAP @ 137.5 kg/ha and MOP @ 50 kg/ha as basal dose followed by application of urea @ 75 kg/ha each at knee height and tasseling stages. For the management of weeds, sowing of crop was followed by pre-emergence application of Atrazine @ 2kg/ha within 2 d of sowing using knapsack sprayer and flood jet nozzle and earthing-up of crop was done 25 d after sowing. For the control of Lepidopteron insects, Decis was sprayed @ 200 ml/ha at 20 days after sowing. Yield attributing factors like number of rows/cob, cob length, cob girth was calculated by randomly selecting the 10 cobs from each experimental plot. The data were represented as average value of these 10 cobs. The number of rows/cob, cob weight, dehusked cob weight, grain weight/cob was calculated as an average of randomly selecting the 5 maize cobs from each plot. Shelling percentage was calculated as follows:

Shelling percentage= 100- {(cob weight-grain weight) × 100/cob weight}

Grain: Cob ratio was calculated as follows:

Grain: Cob ratio= Grain weight per cob/Dehusked cob weight

Grain yield q/ha was calculated from grain yield of each experimental plot as follows:

Grain yield (q/ha) = Plot yield×10000/plot size

A correlation matrix of independent variables with grain yield as dependent variable was estimated. The various data were statistically analyzed by using OPSTAT software. All possible pairs of treatment means were compared using Duncan's multiple range test (DMRT) at 5 per cent probability level.

Results and Discussion

Grain: Cob ratio

The statistical analysis of data (Table 1) on maize cob weight showed that although P 1844 (268.93) surpassed the PMH 10 and DKC 9108 hybrids numerically by a percentage of 21.5 and 18.6, respectively yet the difference was non-significant. The minimum maize cob weight was recorded in PMH 10. A similar trend was recorded in cob weight (after shelling) of the hybrids in which all the treatments were at par with each other. Numerically, P 1844 had highest cob weight

which was computed to be 16.9 and 14.4 per cent higher as compared to PMH 10 and DKC 9108, respectively. Furthermore, analysis of data on grain weight per cob also revealed a non-significant difference between all the hybrids.

Highest grain weight per cob was recorded in P1844 which was 22.6 and 19.6 per cent higher than PMH 10 and DKC 9108, respectively. Similarly, all the hybrids showed non-significant variation from each other with respect to grain: cob ratio, P 1844 resulted in highest (4.27) grain: cob ratio in comparison to PMH 10 (4.11) and DKC 9108 (4.15).

Cob length and cob girth

The data (Table 2) pertaining to cob length revealed a non-significant difference between the treatments. P 1844 hybrid recorded highest cob length as compared to PMH 10 and DKC 9108 with an increase of 0.4 and 10.3 per cent, respectively. Similarly, all the maize hybrids varied non-significantly from each with respect to cob girth at base, middle as well as at top. Highest cob girth was recorded in P 1844 in comparison to other two hybrids. For instance, in P1844, an increase in cob girth at the middle was computed to be 7.4 and 2.3 per cent as compared to PMH 10 and DKC 9108, respectively (Fig. 1 and 2).

Fig.1 Maize cobs of PMH 10, DKC 9108 and P 1844

Fig.2 Cobs of maize hybrids PMH 10, DKC 9108 and P1844

Table.1 Grain: Cob ratio of maize hybrids

Sr. No.	Name of hybrid	Maize Cob weight (g)	Cob weight (g) (after shelling)	Grains weight /cob) (g)	Grain: Cob ratio
1.	PMH 10	221.31^{ns}	43.34^{ns}	177.97^{ns}	4.11^{ns}
2.	P 1844	268.93	50.68	218.26	4.27
3.	DKC 9108	226.84	44.31	182.52	4.15
	SE (d)	24.70	4.30	20.87	0.23
	SE (m)	17.47	3.04	14.76	0.16
	CV	17.9	16.15	18.74	9.64

Table.2 Cob length and cob girth of maize hybrids

Sr. No.	Name of hybrid	Cob length (cm)	Cob girth at base (cm)	Cob girth at middle (cm)	Cob girth at top (cm)
1.	PMH 10	17.89^{ns}	15.21^{ns}	14.89^{ns}	12.72^{ns}
2.	P 1844	17.96	15.96	15.99	13.52
3.	DKC 9108	16.28	15.47	15.63	12.75
	SE (d)	0.84	0.62	0.34	0.19
	SE (m)	0.60	0.44	0.24	0.14
	CV	8.41	6.88	3.75	2.59

Table.3 Grain yield and yield attributes of maize hybrids

Sr. No.	Name of hybrid	Rows/cob (Nos.)	Grains/cob (Nos.)	Shelling percentage	100 seed weight (g)	Grain yield (q/ha)
1.	PMH 10	14.67[c]	411.80^{ns}	80.41^{ns}	32.28^{ns}	68.71[c]
2.	P 1844	17.50[a]	554.33	81.17	33.63	85.46[a]
3.	DKC 9108	16.33[ab]	528.17	80.75	33.97	69.55[b]
	SE (d)	0.71	70.06	6.07	2.42	0.43
	SE (m)	0.50	49.54	4.29	1.71	0.30
	CV	7.58	24.36	13.01	12.58	0.99

Table.4 Correlation matrix of independent variables with grain yield as dependent variable

Variable	MCW	CW	GWPC	G:C	CL	CGB	CGM	CGT	RC	GC	SP	SW	GY
MCW													
CW	1.00*												
GWPC	1.00**	1.00*											
G:C	0.99 NS	0.99 NS	0.99 NS										
CL	0.44 NS	0.43 NS	0.44 NS	0.31 NS									
CGB	0.97 NS	0.97 NS	0.97 NS	0.99 NS	0.21 NS								
CGM	0.82 NS	0.83 NS	0.82 NS	0.89 NS	-0.16 NS	0.93 NS							
CGT	0.99*	0.99 NS	0.99*	0.98 NS	0.50 NS	0.95 NS	0.77 NS						
RC	0.87 NS	0.88 NS	0.87 NS	0.93 NS	-0.06 NS	0.96 NS	0.99 NS	0.83 NS					
GC	0.72 NS	0.73 NS	0.72 NS	0.81 NS	-0.31 NS	0.87 NS	0.99 NS	0.67 NS	0.97 NS				
SP	0.94 NS	0.94 NS	0.93 NS	0.97 NS	0.10 NS	0.99 NS	0.97 NS	0.91 NS	0.98 NS	0.91 NS			
SW	0.43 NS	0.44 NS	0.42 NS	0.54 NS	-0.63 NS	0.63 NS	0.87 NS	0.36 NS	0.82 NS	0.93 NS	0.71 NS		
GY	1.00*	0.99*	0.99*	0.98 NS	0.49 NS	0.95 NS	0.78 NS	1.00*	0.84 NS	0.67 NS	0.91 NS	0.37 NS	

MCW-maize cob weight; CW-cob weight; GWPC-grain weight per cob; G:C-grain:cob;CL- cob length; CGB-cob girth at base; CGM- cob girth at middle; CGT-cob girth at top; RC-rows per cob; GC-grains per cob; SP-shelling percentage; SW-100 seed weight; GY-grain yield

Yield and yield attributes

The data (Table 3) of number of rows per cob showed a significant increase in P 1844 hybrid as compared to PMH 10 but at par with DKC 9108. Increase in number of rows per cob in P 1844 (17.5) was worked out to be 19.3 and 7.2 as compared to PMH 10 and DKC 9108, respectively but the differences were a non-significant. Although the value in maize hybrid P 1844 was at par with other two hybrids but numerically an increasing trend was recorded with per cent increase of 34.6 and 4.95 as compared to PMH 10 and DKC 9108, respectively. Similarly, a non-significant difference was observed between the maize hybrids with respect to shelling percentage. The highest shelling percentage was recorded in P 1844 (81.17) as compared to PMH 10 (80.41) and DKC 9108 (80.75) with per cent increase of 0.95 and 0.52, respectively. Furthermore, data on 100-seed weight revealed a non-significant difference between the hybrids. Numerically, highest 100-seed weight was observed in DKC 9108 with per cent increase of 5.24 and 1.01 as compared to maize hybrids PMH 10 and P 1844, respectively. The data on grain yield of hybrids showed a significantly higher grain yield of 1844 as compared to PMH 10 and DKC 9108 with per cent increase of 24.4 and 22.9, respectively. Highest grain yield in P 1844 can be attributed to increase in number of grains per cob (Table 3), grain weight per cob (Table 1), number of rows per cob (Table 3) in comparison to PMH 10 and DKC 9108.

Correlation analysis

The correlation analysis (Table 4) of all the parameters with grain yield revealed a significant and highly positive correlation of maize cob weight, cob weight, grain weight per cob and cob girth at top with grain yield of hybrids. At the same time, a highly significant positive correlation (1.00) was recorded between maize cob weight and grain weight per cob. A negative but non-significant correlation of cob length with cob girth at mid, cob length, grains per cob and 100-seed weight was also recorded.

From the study, it can be concluded that maize hybrid P 1844 proved superior to PMH 10 and DKC 9108 in terms of number of rows per cob and grain yield.

Although, P1844 was found at par with other hybrids with respect to maize cob weight, cob weight, grain: cob ratio, cob length, cob girth at base, middle and top, shelling percentage, number of grains per cob but numerically it surpassed both hybrids whose benefit is clearly indicated by significant enhancement in grain yield.

The correlation analysis of all the parameters with grain yield revealed a significant and highly positive correlation of maize cob weight, cob weight, grain weight per cob and cob girth at top with grain yield of hybrids.

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