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Comparative analysis of maize (*Zea mays*) hybrids under different methods of planting in spring season

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ABSTRACT

A field experiment was conducted in Yamunanagar district of Haryana during spring 2015 to study the performance of maize (*Zea mays* L.) hybrids under different methods of planting in spring season. The five maize hybrids, i.e. HM-4, HM-9, HM-10, HM-11 and HQPM-5 were tested under three planting methods, viz. ridge, flat and furrow methods with three repeats. The yield attributing characters like cob length, number of grains/cob, grain weight/cob, cob weight/plant and 100 grain weight were found higher under ridge method of planting than flat and furrow methods. The grain yield, stover yield, biological yield, net returns and benefit cost ratio were also recorded higher under ridge method of planting than the other methods, whereas the yield attributing characters, yield, gross returns, net returns and benefit cost were observed higher in hybrid HM-10 over other hybrids grown in the field.

Key words: Economics, Maize hybrids, Planting methods, Yield attributes, Yield

Maize (*Zea mays* L.) is one of the most important cereal crop next to wheat and rice in the world. Globally, maize is referred as 'Miracle crop' or 'Queen of the Cereals' due to its high productivity potential compared to other gramineae family members. It serves as a basic raw material as an ingredient to thousands of industrial products that includes starch, oil, protein, alcoholic beverages, food sweeteners, pharmaceutical, cosmetic, film, textile, gum, package , paper industries, etc. (Kumar *et al*. 2012). Maize cultivation is gaining popularity in spring season because spring maize usually gives more production as compared to *kharif* crop and it is relatively safe from insect pest attack and it can easily be grown in the areas where adequate irrigation facilities are available but the yield recovery of maize at farmer's field is very low as compared to other maize producing countries such as Italy, USA, Canada and Egypt etc therefore to boost up the maize production, proper management techniques are essential. The major techniques are high-yielding hybrids and proper method of planting. Maize can be planted in different ways, viz. ridge planting, furrow planting, flat planting and broadcasting. The response of maize hybrids to various agro-management practices especially; fertilizers, planting methods etc. are different. This variable response is mainly due to differences in plant morphology, intra specific competition in maize plants crop growth rate, crowding stress tolerance of different maize varieties therefore comparative study of promising maize hybrids was also essential in order to screen the most promising hybrids for spring season planting. Keeping all these facts in view the present field experiment had been carried out to evaluate the the performance of maize hybrids under different methods of planting in spring season along with economics.

MATERIALS AND METHODS

Field experiment was conducted during February (spring) 2015 at the Talakaur village of district Yamunanagar working domain of Krishi Vigyan Kendra, Damla of Chaudhary Charan Singh Haryana Agricultural University, Hisar, The experimental site is situated in semi-arid, sub-tropics at an elevation of 255 m above mean sea level with latitude of 30° 07' in the North and longitude of 77° 17' in the East in sub-tropical zone. The soil of the experimental field was sandy loam in texture, well drained slightly alkaline in reaction, low in nitrogen (116 kg/ha), medium in phosphorus (14 kg/ha) and high in exchangeable potash (365 kg/ha). In general weather conditions were favourable for plant growth and no severe pest and disease were noticed. The treatments consisted of three planting methods (i) Ridge, (ii) Flat and (iii) Furrow methods of planting and five hybrids (i) HM-4, (ii) HM-9, (iii) HM-10, (iv) HM-11 and (v) HQPM-5. The experiment was laid out in a split-plot design keeping methods of planting in main plot and hybrids in sub-plot with three replications. The seed bed was prepared by four harrowing followed by cultivator twice followed by

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Table 1 Yield, yield attributes and economics of maize as affected by different planting methods and hybrids

Treatment	No. of grains/ cob	100 grain weight (g)	Grain weight/cob (g)	Cob weight/ Plant (g)	Length of cob (cm)	Grain yield (kg/ha)	Stover yield (kg/ha)	Biological yield (kg/ha)
Planting methods								
Ridge	409	23.31	94.54	113.38	17.95	6356	9522	15872
Flat	394	21.32	83.21	101.29	17.13	5917	8800	14707
Furrow	381	20.80	78.45	97.34	15.47	5699	8537	14232
SEm±	04	0.57	1.90	2.57	0.35	87	132	194
CD (P=0.05)	14	1.88	6.19	8.88	1.38	310	450	640
Hybrids								
HM-4	370	22.30	82.51	102.05	16.28	5835	8292	14127
HM-9	333	24.63	82.02	98.61	15.77	5684	7739	13424
HM-10	455	20.10	91.44	112.48	18.87	6553	10320	16832
HM-11	418	20.56	85.94	103.53	17.21	5984	9701	15684
HQPM-5	397	21.41	85.10	103.27	16.12	5900	8717	14617
SEm±	8	0.55	1.72	2.84	0.49	158	197	332
CD (P=0.05)	22	1.62	5.01	8.31	1.45	462	577	970

planking. Pre-sowing irrigation was applied to the desired area of the field to facilitate preparatory tillage and seed germination in flat and furrow methods and ridges are made in the dry soil with the help of tractor drawn ridger depending upon the treatments for dibbling of maize seed manually. The crop was raised with recommended package of practices. For recording yield and yield attributes namely number of grains/cob, 100 grain weight (g), grain weight/ cob (g), cob weight/plant (g) and length of cob (cm), the number of cobs of five randomly selected plants from each plot was used. The grain yield of each plot was thoroughly cleaned and sun dried. The yield from each plot was recorded separately as kg/plot and then converted into kg/ ha. After removal of the cobs from the stalks of each plot, the stalks were weighed to determine the stover yield (kg/ ha). The economics parameters like net returns and benefit cost ratio were calculated on the basis of prevailing prices of cobs and fodder.

RESULTS AND DISCUSSION

Yield and yield attributes

The study revealed that the yield attributing parameters of maize were significantly higher under ridge method as compared to flat and furrow methods of planting these results were similar to the finding of Gul *et al.* (2015) they revealed that ridge sowing significantly improved cob length, number of grains/cob, grain weight/cob, cob weight/ plant and 100 grain weight. Higher cob length might be attributed to higher leaf area index, dry matter accumulation and plant height in fertile loose soil of ridges further, more water and nutrient availability on ridges resulting in improved grain weight/cob, cob weight/plant, number of grains/cob and 100- grain weight. Similarly Singh *et al.* (2015) reported that yield and yield attributes were significantly influenced by different planting methods hence cob length, number of grains/cob and 100-grain weight were significantly higher on ridge method of planting than flat and furrow methods due to accelerated root aeration and root activity resulting in maintaining higher chlorophyll content in their leaves thus plants had higher pace of photo assimilate production thus higher value of different yield parameters were obtained, whereas among the maize hybrids HM-10 had more production potential over other hybrids, similarly it has significantly higher values of yield attributes, might be due to higher plant height, RGR, and dry matter production as discussed earlier resulting in higher yield attributes. These results were in unison with those obtained by Zamir *et al.* (2012) and Saqib *et al.* (2012). The ridge planted maize recorded significantly higher grain and stover yield

Table 2 Effect of planting methods and hybrids on economics of various treatments

Treatment	Total cost of Cultivation (₹/ha)	Gross return (₹/ ha)	Net return (₹/ha)	B:C
Planting methods				
Ridge	49808	100637	50829	2.02
Flat	49500	92334	42834	1.86
Furrow	49808	88714	38907	1.78
Hybrids				
HM -4	49705	89417	39766	1.80
HM-9	49705	88449	38744	1.78
HM-10	49705	105036	55331	2.11
HM-11	49705	94012	44307	1.89
HQPM-5	49705	92506	42801	1.86

as compared to flat and furrow methods. The increase in grain yield of maize under ridge method could be attributed to higher yield attributes, whereas the increase in stover yield was due to higher dry matter production, leaf area index (LAI), to some extent it could also attributed to better soil environment. These results were in unison with those obtained by Painyuli *et al.* (2013), Kumar *et al.* (2014) and Gul *et al.* (2015). The grain, stover and biological yield of maize were significantly higher with hybrid HM-10 as compared to other hybrids. The increase in grain yield could be attributed to the higher number of plants, dry matter production, higher LAI, increased number of cobs, cob length and 100 grain weight. Whereas, higher stover and biological yield were mainly because of more dry matter accumulation, plant height and maximum LAI with HM-10 maize hybrid. The findings are corroborated the results obtained by Jat *et al.* (2011) and Dawadi and Sah (2012).

Economics

The gross returns, net returns and benefit cost ratio were maximum under ridge method of planting than flat and furrow methods. This might be due to higher productivity from plants grown under ridge method of planting. These results were in agreement with Painyuli *et al.* (2013), Anjum *et al.* (2014) and Kumar *et al.* (2014) and in case of hybrids gross returns, net returns as well as benefit cost ratio were maximum with hybrid HM-10 because yield attributes, grain and stover yield were significantly higher followed by hybrid HM-11 and minimum in hybrid HM-9 in spite of same cost of production. The similar trend was reported by Zamir *et al.* (2011) and Dawadi and Sah (2012).

On the basis of results it can be concluded that in spring season, the maize hybrid HM-10 should be planted on ridges for achieving yield attributes and ultimately yield therefore fetching higher gross returns, net returns and benefit cost ratio hence sowing of maize hybrid HM-10 on ridges is most economical in spring season.

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