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Performance of Maize Hybrids (*Zea mays* L.) under Different Sowing Windows

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A B S T R A C T

The field experiment was conducted at Research farm of Department of Agricultural Meteorology, college of Agriculture, Parbhani during *kharif* 2017 to study the performance of maize hybrids (*Zea mays L.)* under different sowing windows. The experiment comprised of five dates i.e. 25th SMW, 26th SMW, 27th SMW, 28th SMW and 29th SMW as main plot treatment with two maize hybrid *viz.* H_1 (PIONEER-3501) and H_2 (MONSANTO-9126) as sub plot treatments and replicated thrice. Factorial Randomized Block Design, gross and net plot sizes were 6.0 x 5.0 m^2 and 4.8 x 4.2 m^2, respectively with spacing of 60 x 30 cm. The results revealed that among the five different dates of sowing. D_1-25th SMW sowing and hybrid H_1 (PIONEER-3501) resulted in crop sown with higher growth and yield parameters significantly *i.e.* Plant height, functional leaves, days to 50% tasseling, days to 50% silking, Number of cob per plant, length of cob, diameter of cob, Number of grain per cob and test weight also first date of sowing D_1-25th SMW significantly highest grain yield (4969 kg/ha) followed by D_2 (4816 kg/ha), D_3 (4627 kg/ha) D_4 (4424 kg/ha) and D_5(4131 kg/ha) and among hybrid H_1 (PIONEER-3501) (4609 kg/ha) and H_2 (MONSANTO-9126) (4578 kg/ha) respectively.

Introduction

Maize is called as queen of cereal due to its great importance in human, animal diet and high yielding ability. It efficiently utilizes solar energy and has immense potential for higher yield, and called as "Miracle Crop". It is the crop of the future as mentioned by the Father of Green Revolution, Renounced Nobel Laureate Dr. Norman E. Borlaug. Maize plays a vital role in ensuring food security as well as nutritional security through quality protein (Rawool, 2004). In India, area and production of maize are about 9.23 million hectares and 23.73 million tonnes respectively, having average productivity about 2564 kg ha^{-1}. In Maharashtra, the area and production of maize is about 1.05 million hectares and 2.20 million tonnes production with the productivity of 2080 kg ha^{-1} (Anonymous, 2015). It ranked next to rice, wheat and sorghum in respect of area and production. Though it is consumed all over the country but it is a staple food of people in

hilly and sub mountain area of North India. It is extensively grown in Uttar Pradesh, Bihar, Rajasthan, Madhya Pradesh etc. (Dayanand and Jain, 1994). The productivity of maize in Marathwada is low (1983 kg ha^{-1}) as compared to Maharashtra i.e. 2066 kg ha^{-1}.

Climate variability has a direct influence on the quantity and quality of maize production as water shortage combined with thermal stress adversely effect maize productivity. To deal with the impact of climate change, the potential adaption strategies are changing sowing dates; crop diversification, integrated farming system, etc. Optimum sowing date is important to mitigate climate change. Growing a suitable hybrid at an optimum sowing time may be better agronomic option under the water starved condition. There is need to evaluate the different maturity hybrids of maize for their growth and yield under varying sowing dates (Pathak *et al.,* 2011).

Materials and Methods

The field experiment was conducted during the *Kharif* 2017 at Research farm of Department of Agricultural Meteorology, college of Agriculture Parbhani to study the performance of maize hybrids (*Zea mays L.)* under different sowing windows. The experiment was laid out in Factorial Randomized Block Design replicated three times. The treatments comprised of five dates of sowing i.e., 25^{th} SMW, 26^{th} SMW, 27^{th} SMW, 28^{th} SMW and 29^{th} SMW in main plots and two maize hybrid H_1 (PIONEER-3501) and H_2 (MONSANTO-9126) in sub plots. Gross and net plot sizes were 6.0 x 5.0 m^2 and 4.8 x 4.2 m^2, respectively. Sowing was done by dibbling method with spacing of 60 x 30 cm. The entire recommended packages of practices were adopted. The crop was harvested at physiological maturity. Data on growth, yield components and yields were recorded as per procedure. The observations pertaining to all biometric observation 15 days interval and post-harvest yield attributes observations were recorded at harvest.

Results and Discussion

Growth parameters

Perusal of data presented in Table 1 revealed that significant differences were observed done to dates of sowing and hybrids in respect of growth characters. Date of sowing significantly influenced plant height and functional leaves. Mean plant height was significantly higher in sowing date *i.e.* D_1 (SMW 25) which was superior over D_4 (28 SMW) and D_5 (29 SMW) and was found at par with D_2 (26 SMW) and D_3 (27 SMW) sowing dates. These results are similar by Idikut *et al.,* (2005), Namakka *et al.,* (2008). However the hybrid H_1 (PIONEER 3501) recorded highest plant height and functional leaves which followed by hybrid H_2 (MONSANTO 9126) and interaction between date of sowing and hybrid was non-significant. Decrease in plant height and functional leaves in late sowing were due to shorter growing period. These results are similar to those of by Shah *et al.,* (2012) and Jadhav *et al.,* (2015).

Days to 50% tasseling and days to 50% silking

The data on mean number of days required for 50% tasseling and 50% silking plant as influenced by different treatments are presented in Table 1. Mean number of days required to 50% tasseling and 50% silking was significantly higher in treatment D_1 (SMW 25) (49.5) and (53.0) respectively which was superior over the rest of sowing dates. However hybrid H_1 (PIONEER 3501) (47.0) and (50.0) as per to H_2 (MONSANTO 9126). This might be due to favorable weather condition with the respective treatment.

Table.1 Periodical mean growth and yield attributing characters of maize as influenced by different treatments

Treatments	Growth and yield characters						
	Plant Height (cm)	Functional Leaves	Days to 50% tasseling	Days to 50% silking	Number of cob plant^{-1}	Length of cob (cm)	Diameter of cob (cm)
Date of Sowing							
D_1 (25^{th} SMW)	204.08	14.51	49.50	53.00	1.53	16.22	4.85
D_2 (26^{th} SMW)	200.63	13.85	47.50	50.50	1.39	15.28	4.66
D_3 (27^{th} SMW)	199.92	13.63	46.50	49.50	1.14	15.26	3.73
D_4 (28^{th} SMW)	194.75	13.56	45.50	47.50	1.26	13.73	3.99
D_5 (29^{th} SMW)	189.67	13.71	44.50	46.50	1.11	13.02	3.44
S.E. ±	2.18	0.16	1.01	0.71	0.02	0.13	0.15
CD at 5 %	6.48	0.57	3.01	2.13	0.06	0.52	0.45
Hybrids							
H_1 (PIONEER 3501)	203.53	13.87	47.00	50.00	1.32	14.73	4.29
H_2 (MONSANTO 9126)	192.09	13.84	46.40	48.80	1.26	14.67	3.97
S.E ±	1.38	0.13	0.64	0.45	0.01	0.01	0.09
CD at 5 %	4.10	0.38	1.90	1.34	0.03	0.04	0.28
Interaction (D x V)							
S.E ±	3.09	0.51	1.43	1.01	0.28	0.33	2.14
CD at 5 %	NS	NS	NS	NS	NS	NS	NS
General Mean	197.81	13.85	46.70	49.40	1.29	14.70	4.13

Table.2 Yield attributes of maize as influenced by different treatments

Treatments	Post-harvest Observation					
	Number of grain cobs^{-1}	Test weight (g)	Grain yield (kg ha^{-1})	Stover yield (kg ha^{-1})	Biological Yield (kg ha^{-1})	Harvest Index (%)
Date of Sowing						
D_1 (25th SMW)	390	244	4969	10825	15794	31.46
D_2 (26th SMW)	378	240	4816	10302	15118	31.85
D_3 (27th SMW)	366	237	4627	9658	14285	32.39
D_4 (28th SMW)	357	234	4424	9597	13885	31.86
D_5 (29th SMW)	336	221	4131	9337	14021	29.46
S.E. ±	7.96	10.02	57.39	51.17	108.56	0.52
CD at 5 %	23.88	NS	170.27	151.81	322.08	NS
Hybrids						
H_1 (PIONEER 3501)	377	239	4609	10047	14656	31.44
H_2 (MONSANTO 9126)	364	231	4578	9840	14418	31.75
S.E ±	0.71	6.33	36.30	32.36	68.66	0.52
CD at 5 %	2.21	NS	107.69	96.00	203.69	NS
Interaction (D x V)						
S.E ±	2.95	0.30	81.16	92.36	173.52	0.46
CD at 5 %	NS	NS	NS	NS	NS	NS
General Mean	365	238.82	4593	9443	14036	32.72

Similar results were reported by Parashar (2001) and Hemilatha *et al.,* (2013).

Yield attributes characters

The data on mean number of cobs per plant, length of cob, diameter of cob, number of grain per cob and test weight as influenced by different sowing dates and hybrids are given in Table 1 and 2. The number of cobs per plant, length of cob, diameter of cob, number of grain per cob and test weight was considered as the most important yield contributing characters and they are varied significantly under different date of sowing and hybrids. Sowing of maize at 25th SMW, significantly influenced the yield attributing characters and significantly superior over the delayed sowing. Analysis revealed that sowing done in 25th SMW and first hybrid (PIONEER 3501) was a significantly superior followed by 26th SMW, 27th SMW, 28th SMW and 29th SMW respectively. This might be due to favorable rainfall, temperature requirement as per crop need may have boosted crop growth in the form of higher photosynthetic accumulation and resulting higher yield parameters in early sown crop. These results are also in conformity to that of by Prodhan (2001), Rahman *et al.,* (2001) and Namakka *et al.,* (2008).

Yields

The data on mean grain, straw and biological yield of maize as influenced by different sowing dates and hybrids are given in Table 2 the data indicated that mean grain, straw and biological yield was 4593 kg ha$^{-1,}$ 9443 kg ha^{-1} and 14036 kg ha^{-1} respectively. Different date of sowing significantly influenced the grains and straw yields (Table 2). The maize sown in 25th SMW produced significantly higher grain yield (4969 kg/ha) and followed by D_2 (4816 kg/ha), D_3 (4627 kg/ha), D_4 (4424 kg/ha) and D_5 (4131 kg/ha).There was 7%, 11% and 17% reduction in the grain yield in 27th SMW, 28th SMW and 29th SMW. This might be due to delayed sowing as compared to first date of sowing i.e. 25th SMW. However among hybrid H_1 (PIONEER 3501) was (4609 kg/ha) and H_2 (MONSANTO 9126) (4578 kg/ha) respectively. These results were in conformity by Pradhan (2001), Rahman *et al.,* (2001) and Sulochana *et al.,* (2015). The straw and biological yield was produced significantly higher in 25th SMW as compare to rest of sowing dates and first hybrid (PIONEER 3501) was more yield as compare to H_2 (MONSANTO 9126) respectively.

Sowing of maize during different sowing dates significantly influenced growth and yield characters. Plant height, functional leaves, days to 50% tasseling, days to 50% silking, Number of cob per plant, length of cob, diameter of cob, Number of grain per cob and test weight were significantly more when maize sown during 25th SMW and variety (PIONEER 3501) was sown during 25th SMW favoured most of the growth and yield contributing characters. However D_1-25th SMW significantly highest grain yield (4969 kg/ha) followed by D_2 (4816 kg/ha), D_3 (4627 kg/ha) D_4 (4424 kg/ha) and D_5 (4131 kg/ha) and among hybrid H_1 (PIONEER-3501) (4609 kg/ha) and H_2 (MONSANTO-9126) (4578 kg/ha).

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