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RESPONSE OF MAIZE (*ZEA MAYS* L.) HYBRIDS FOR FODDER AND GRAIN YIELD IN DIFFERENT SPACING AND FERTILITY LEVELS IN *KHARIF* SEASON

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SUMMARY

A field experiment entitled "Response of hybrid maize to spacing and fertility management" was conducted at Maize Research Station, S. D. Agriculture University, Bhiloda (Gujarat) for three *kharif* seasons (2014-2017) in loamy sand soil. The experiment laid out in split plot design comprised of two main and one sub-factor treatments arrangement with three replications. Between two varieties, V_1 (CO 6) produced significantly higher grain and fodder yield as compared to variety V_2 (HQPM1) in all the years and also in pooled analysis. In pooled data, variety V_1 (CO 6) produced 5842 and 9865 kg/ha grain and fodder yield, respectively. Application of every higher levels of fertilizer resulted in significantly higher grain and fodder yield during first and second year and pooled data as well. However, during third year, treatment F_3 (180: 90: 00, N: P: K kg/ha) produced significantly higher grain and fodder yield over its lower levels of fertilizer *i.e.* F_1 (120: 60: 00, N: P: K kg/ha) and F_2 (150: 75: 00, N: P: K kg/ha) which were at par in their effect. The hybrid maize (CO-6) gave higher grain and fodder yield and net return, under spacing of 60 cm × 20 cm (83,333 plants per ha) and with fertilizer dose of 180:90:00 NPK/ha, when nitrogen applied in four splits *i.e.,* at basal (20%), four leaf stage (30%), eight leaf stage (40%) and tasseling stage (10%) where as P_2O_5 was applied as basal) during *kharif* season.

Key Word : Maize, spacing, fertilizer levels, grain and fodder yield

In India, maize has been widely cultivated as a *kharif* crop. The area, production and productivity of maize in India is 8.69mha, 21.81mt and 2509 kg/ha, respectively. While in Gujarat, it covers an area of 3.90 lac ha with total production of 5.70 lac tonnes with 1478 kg/ha productivity (Anonymous, 2016). The average productivity of Gujarat is very less as compared to India due to poor agronomical management. The productivity of hybrid maize is boost by improving agronomical management. Among agronomic factor adequate fertilizer level and plant population play important role on growth and development of maize hybrid, which directly link with productivity. Plant population is maintained at inter or intra row levels of spacing of crops and it is alter considerably due to environment under which it is grown. Maize is a plant with individual productivity hence plant population determines yield significantly (Pepo and Sarvari, 2013). Roekel and Coulter (2011) found a close link between maize yield and plant population, hybrid produce maximum yield at plant population of 81,700 plants per ha or even more than that.

Maize crop known to its responsive nature towards input *i.e* nutrients, water, seed, etc., among these inputs fertilizer management play crucial role on productivity of maize. Among the nutrient the plants primary nutrients *viz*., Nitrogen (N), Phosphorus (P_2O_5) and Potassium (K_2O) are very important and its deficiency direct affect on growth, yield and its attributing traits of maize. Majority of Indian soil shows deficiency of nitrogen. Moreover, the response Nitrogen varies with crop place, spacing, initial fertility status of soil and other environmental factor as well. Phosphorus is important to simulate easily and extensive rapid maize growth and mature easily (Sankran *et al.* 2005). Based on soil status potassium is adequately present in soil hence no need to application. Considering the importance of proper spacing and fertilizer requirement of maize hybrid, the study conducted during three *kharif* season.

MATERIAL AND METHODS

A field experiment response of hybrid maize to spacing and fertility management was investigated at Maize Research Station, S. D. Agriculture University, Bhiloda (Gujarat) for three *kharif* seasons (2014-2017). The experiment of *Kharif* 2015 vitiated due to heavy rain followed by plant lodging condition. The soil of experimental sites was loamy sand with a pH of 7.56, EC of 0.17 dsm^{-1} and low levels of organic carbon (0.3%), available N (190 kg/ha) , available P_2O_5 (50 kg/ha) and medium level of K_2O. The micronutrients *viz*., Fe; Mn; Zn and Cu (DTPA extractable) status of soil were 4.40, 13.25, 0.57 and 1.37ppm, respectively.

The experiment laid out in split plot design comprised two main and one sub-factor treatments arrangement with three replications. The main factor (A) treatment consisted of two hybrids *i.e*., V_1= CO-6 and V_2= HQPM-1 of yellow maize and three levels of spacing *i.e*., S_1 : 45cm x 20 cm, S_2 : 60 cm x 20 cm and S_3: 60cm x 25cm. The plant density (population) were maintained as per spacing treatments *viz*., S_1 : 1,11,111 plants per ha, S_2 : 60 cm x 20 cm 83,333 plants per ha and S_3: 66,666 plants per ha. The sub factor (B) treatment comprised of three fertility (NPK kg/ha) levels *i.e*., F_1= 120: 60: 00, F_2: 150: 75: 00 and F_3: 180:90:00, while 10 kg/ha of $ZnSO_4$ applied as a common dose for all the treatment. The nitrogen was applied in four splits *i.e*., 20% (at basal), 30% (at 4 leaf stage), 40% (at 8 leaf stage) and 10% (at flowering stage). The entire phosphorus applied in basal form (at a time of sowing). The herbicide Atrazine @2.0 kg/ha was applied as a pre-emergence.

All standard agronomic practices were followed. The rainfall patterns were recorded during experimentation years, over all precipitation were normal and satisfactory over three years (Fig 1). The plant population, yield and attributing traits were recorded from net plot (3.6m x 5.0 m). The kernel yield from cob yield was computed in each plot with modification of method mentioned by Bhupender Kumar (2016) by reducing grain moisture content to 15 percent with stepwise formula. (a) grain yield at observed grain moisture content [? Ear yield kg/net plot at harvest × Multiple factor for ha × shelling proportion (%)], (b) grain dry matter content = 1- moisture per cent at harvest, (c) grain yield at 15% grain moisture content = [(grain yield at observed grain moisture content x grain dry matter content)/0.85], (d) grain yield at 15 % grain moisture content = [(grain yield at 15% grain moisture content)/100]. The record data from each year and pooled basis was analysed statistically by using analysis of variance techniques appropriate to split plot design two main and one sub factor (Spd 21) using computer generated software (SPAR 1.0).

RESULTS AND DISCUSSION

The grain and fodder yields of *kharif* maize were influenced significantly due to different varieties during all the years of experimentation as well as in pooled analysis (Table 1.). Between two varieties, V_1 (CO 6) produced significantly higher grain and fodder yield as compared to variety V_2 (HQPM1) in all the years and also in pooled analysis. In pooled data, variety V_1 (CO 6) produced 5842 and 9865 kg/ha grain and fodder yield, respectively.

The data presented in Table 1 indicates that different spacing had significant effect on grain and fodder yield of *kharif* maize during all three years of study as well as in pooled data except fodder yield in second year. When maize crop was sown under spacing of 60 cm × 20 cm (S_2) produced significantly the highest grain yield over rest of the spacing *i.e*. S_3 (60 cm × 25) and S_1 (45 cm × 20) during all the three years and also in pooled results except during second year wherein it was being at par with S_3 treatment. The similar trend was also observed in case of fodder yield.

The individual as well as pooled data revealed that the grain and fodder yields of *kharif* maize were affected significantly due to different fertilizer levels (Table 1). Application of every higher levels of fertilizer resulted in significantly higher grain and fodder yield during first and second year and pooled data as well. However, during third year, treatment F_3 (180: 90: 00, N : P : K kg/ha) produced significantly higher grain and fodder yield over its lower levels of fertilizer *i.e*. F_1 (120: 60: 00, N: P: K kg/ha) and F_2 (150: 75: 00, N: P: K kg/ha) which were at par in their effect.

The interaction effect of V × S was found significant on grain yield during first year, while in fodder yield it was significant in first year and in pooled data. The treatment combination V_1S_2 produced significantly the highest grain yield in first year and fodder yield in first year and in pooled data over rest of the treatment combinations (Table 2).The interaction effect between V and F was found significant on grain and fodder yield during first year

TABLE 1

Effect of different treatments on grain yield (kg) ; fodder yield (kg) and plant stands per hectare

Treatment	Grain yield (kg/ha)				Fodder yield (kg/ha)				Plant stands per hectare			
Year	2014	2016	2017	Pooled	2014	2016	2017	Pooled	2014	2016	2017	Pooled
Main plot												
Variety (V)												
V_1 : CO 6	6352	5761	5413	5842	10380	9692	9524	9865	79034	77264	79095	78464
V_2 : HQPM 1	5014	4064	4128	4402	7849	7463	7591	7634	77881	78560	78622	78354
S. Em±	80.2	95.6	62.2	91.6	122.9	164.7	130.3	81.1	963.3	1012.0	710.6	522.5
C. D. (P=0.05)	253	301	196	557	387	519	411	234	NS	NS	NS	NS
C. V. (%)	7.3	10.1	6.8	8.2	7.0	10.0	7.9	8.3	6.4	6.8	4.7	6.0
Spacing (S)												
S_1 :45 cm × 20 cm	5120	4424	4501	4682	8739	8427	8255	8474	99075	98242	99661	98993
S_2 : 60 cm × 20 cm	6358	5283	5222	5621	9960	9039	9028	9342	75433	74538	75402	75124
S_3 :60 cm × 25 cm	5570	5032	4590	5064	8645	8265	8389	8433	60865	60957	61513	61111
S. Em±	98.2	117.1	76.2	110.3	150.6	201.8	159.6	172.1	1180	1240	870	1108
C. D. (P=0.05)	309	369	240	433	474	NS	503	497	3717	3906	2742	3201
Sub plot												
Fertilizer levels (NPK kg/ha)												
F_1 : 120:60:00	5244	4493	4543	4760	8447	8150	8028	8208	78550	77964	78797	78437
F_2 : 150:75:00	5552	4721	4510	4928	8950	8497	8457	8634	78519	77994	78828	78447
F_3 : 180: 90:00	6252	5525	5259	5679	9947	9084	9187	9406	78303	77778	78951	78344
S. Em±	90.2	76.9	66.2	45.3	138.0	94.7	169.6	79.4	541	692	693	373
C. D. (P=0.05)	263	225	193	128	403	277	495	224	NS	NS	NS	NS
C. V. (%)	6.7	6.6	5.9	6.5	6.4	4.7	8.4	6.7	3.0	3.8	3.7	3.5
Interaction effect												
V × S	Sig.	NS	NS	NS	Sig	NS	NS	Sig.	NS	NS	NS	NS
V × F	Sig.	NS	NS	NS	Sig	NS	NS	NS	NS	NS	NS	NS
S × F	NS	Sig.	NS	Sig	NS	Sig.	NS	NS	NS	NS	NS	NS
V × S × F	NS	Sig.	NS	Sig	NS	Sig.	NS	NS	NS	NS	NS	NS
Y × V		Sig		NS		NS						
Y × S		Sig		NS		NS						
Y × F		NS		NS		NS						
Y × V × S × F		NS		NS		NS						

of study. The treatment combination V_1F_3 recorded significantly the highest grain and fodder yield over rest of the treatment combinations. (Table 3).The interaction effect of S × F was found significant with respect to grain yield in second year and pooled data and fodder yield during second year. The treatment combination S_2F_3 produced significantly the highest grain yield over rest of the treatment combinations. The same treatment combination (S_2F_3) also produced significantly the highest fodder yield over rest of the treatment combinations (Table 4).The interaction effect of V × S × F was found significant on grain yield during second year and in pooled data and fodder yield in second year. The treatment combination $V_1S_2F_3$

TABLE 2

Interaction effect of V × S on grain yield (kg/ha) in 2014 and fodder yield (kg/ha) in 2014 and pooled data

Treatment	Grain yield (kg/ha)			Fodder yield (kg/ha)					
	2014			2014			Pooled		
	S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
V_1	5809	7302	5945	10166	11582	9393	9668	10632	9296
V_2	4431	5414	5196	7312	8337	7898	7280	8052	7570
S. Em±		139			273			141	
C. D. (P=0.05)		437			671			406	

TABLE 3

Interaction effect of V × F on grain yield (kg/ha) and fodder yield (kg/ha) in 2014

Treatment	Grain yield (kg/ha)			Fodder yield (kg/ha)		
	F_1	F_2	F_3	F_1	F_2	F_3
V_1	5713	6361	6982	9417	10475	11249
V_2	4776	4743	5522	7478	7424	8645
S. Em±		128			195	
C. D. (P=0.05)		372			570	

recorded significantly the highest grain yield and fodder yield over rest of the treatment combinations (Table 5).

The treatment effects of seed index were found during first year and pooled data significant for spacing effects. Treatment S_2 gave higher test weight (27.8 gm) but it was at par with S_3 levels that is 27.2 gm. in pooled data. In case of variety and fertilizer levels, treatment effects revealed significant effects during first year, treatment V_1 and F_3 gave significantly higher seed index *i.e.*, 30.0 gm and 28.0 gm respectively. In case of second and third year treatment V_1 (CO-6) gave significantly higher seed index as compared to treatment V_2 (HQPM-1). The treatment effects for cob girth were found significant in pooled data for spacing and fertilizer effects. Treatment S_3 gave the higher cob girth (13.4 cm) but it was at par with S_2 levels that is 13.3 cm. In case of fertility levels, treatment F_3 gave the higher cob girth (13.3 cm). Whereas the treatment effects for cob length were found significant or at par effects during individual years for spacing and fertility levels. The spacing 60 cm × 20 cm and fertilizer level 180:90:00NPK (kg/ha) gave significantly highest or at par effects during most of experimentation year (Table 6).

The treatment effects of pooled data for plant height were found significant for various fertilizer levels. Treatment F_2 significantly increase plant height (182 cm) but it was at par with F_3 levels that is 179cm. Similarly, for cob height the treatment effects were found significant for various fertilizer levels. Treatment F_2 significantly increase cob height (89 cm) but it was at par with F_3 levels that is 88 cm (Table 7). In case of number of kernel rows per cob, the treatment effects were found significant for fertilizer levels. Treatment F_3 produces more number of rows per cob

TABLE 4

Interaction effect of S × F on grain yield (kg/ha) in 2016, pooled and fodder yield (kg/ha) in 2016

Treatment	Grain yield (kg/ha)			Fodder yield (kg/ha)					
	2016			Pooled			2016		
	F_1	F_2	F_3	F_1	F_2	F_3	F_1	F_2	F_3
S_1	4193	4151	4928	4419	4469	5157	8049	8801	8432
S_2	4590	5044	6214	5152	5332	6378	8199	8902	10016
S_3	4698	4967	5431	4710	4981	5501	8203	7788	8805
S. Em±		133			78			164	
C. D. (P=0.05)		389			221			479	

TABLE 5

Interaction effect of V × S × F on grain yield (kg/ha) in 2016, pooled and fodder yield (kg/ha) in 2016

Treatment	Grain yield (kg/ha)			Fodder yield (kg/ha)					
	2016			Pooled			2016		
	F_1	F_2	F_3	F_1	F_2	F_3	F_1	F_2	F_3
V_1S_1	5241	4461	5625	5177	5008	5800	9174	9936	9561
V_1S_2	5256	5971	7308	5879	6136	7354	9629	9537	11004
V_1S_3	5587	5937	6467	5226	5768	6232	9215	8771	10399
V_2S_1	3145	3841	4232	3661	3930	4515	6924	7666	7302
V_2S_2	3924	4117	5120	4424	4529	5402	6769	8266	9028
V_2S_3	3808	3997	4396	4194	4194	4770	7191	6806	7211
S. Em±		188			111			232	
C. D. (P=0.05)		550			312			677	

(12.7). While for number of kernels per row, the treatment effects were found significant in spacing levels. Treatment S_3 produces more number of kernels per rows (28.6) but it was at par with S_2 levels that is 28.3 in pooled data (Table 8).

In present study, yield and its attributes of hybrid maize significantly influenced by plant density (spacing) and different fertilizer levels (N & P_2O_5). Earlier Sarlangue *et al.* (2007) also reported same trends for plant density in maize. According to Monneveux *et al.* (2005) the higher yield in maize only achieved through proper plant density. The plant spacing was also influenced significantly on yield attributing traits *viz.*, Cob length, cob girth, seed index, number of kernels per row and number of kernel rows per cob. The values of these traits were decreased at higher plant density (45cm × 25cm).Testa *et al.* (2016) reported the negative effects of more plant population on cob length (-10.8%), kernel weight (-7.1%), number of kernels per row (-10.0%) and 1000 kernel weight (-18.0%). The yield of hybrid CO-6 and HQPM-1 significantly differed at various levels of spacing and fertilizer. Nielson (2012) reported the genetic potential of a particular variety or hybrid significantly influenced at different plant population. Plant population considered as a important factor determining the degree of competition between plants (Sher *et al.*, 2017). Eszter (2015) also recorded maximal yield at higher plant density (85845 plant/ha).

Among the major macronutrient N is the major structural constitute of cell. The rate of vegetative and reproductive growth increase as N level increase mainly due to increasing in assimilating surface of plant as well as total photosynthesis. Being C_4 plant the grain yield of maize is largely governed by rate of photosynthesis (source) to grain (sink) relationship, which is directly related to nitrogen. This is the main cause to increase grain yield when

TABLE 6
Effect of different treatments on Seed index (gm), cob length (cm) and Cob girth (cm)

Treatment	Seed Index (gm)				Cob length (cm)				Cob girth (cm)			
Year	2014	2016	2017	Pooled	2014	2016	2017	Pooled	2014	2016	2017	Pooled
Main plot												
Variety (V)												
V_1 : CO 6	30.0	28.2	31.5	29.9	16.0	13.5	16.9	15.5	13.0	12.1	14.5	13.5
V_2 : HQPM 1	25.0	25.1	23.1	24.5	14.0	13.3	15.1	14.2	13.0	12.0	13.5	12.9
S. Em±	0.23	0.54	0.34	1.11	0.11	0.13	0.22	0.42	0.07	0.07	0.13	0.20
C. D. (P=0.05)	1.40	1.69	1.10	NS	0.70	NS	0.68	NS	0.50	NS	0.42	NS
C. V. (%)	4.4	10.5	6.4	7.5	3.8	4.92	7.0	6.1	2.9	2.93	5.0	4.3
Spacing (S)												
S_1 : 45 cm × 20 cm	26.0	26.4	26.6	26.6	13.0	12.7	15.3	13.8	12.0	11.7	13.8	12.8
S_2 : 60 cm × 20 cm	28.0	26.7	28.0	27.8	16.0	13.6	16.0	15.4	13.0	12.2	14.1	13.3
S_3 : 60 cm × 25 cm	27.0	26.9	27.3	27.2	15.0	13.7	16.6	15.3	13.0	12.2	14.1	13.4
S. Em±	0.29	0.66	0.40	0.48	0.18	0.16	0.26	0.41	0.11	0.08	0.16	0.13
C. D. (P=0.05)	0.9	NS	NS	1.38	0.5	0.49	0.83	NS	0.3	0.26	NS	0.39
Sub plot												
Fertilizer levels (NPK kg/ha)												
F_1 : 120 : 60 : 00	27.0	26.7	27.3	27.1	15.0	13.4	15.5	14.8	13.0	11.9	13.9	13.0
F_2 : 150 : 75 : 00	26.0	26.4	27.5	26.9	15.0	13.6	16.0	14.9	13.0	12.2	13.9	13.2
F_3 : 180 : 90 : 00	28.0	26.8	27.1	27.6	15.0	13.2	16.4	14.9	13.0	12.1	14.2	13.3
S. Em±	0.29	0.73	0.50	0.31	0.18	0.11	0.21	0.23	0.11	0.10	0.11	0.07
C. D. (P=0.05)	0.85	NS	NS	NS	0.5	0.31	0.61	NS	0.32	NS	NS	0.19
C. V. (%)	4.6	11.6	7.7	8.4	5.3	3.37	5.56	4.9	3.5	3.45	3.25	3.8
Interaction effect												
V × S	Sig	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
V × F	Sig	NS	NS	NS	NS	NS	NS	NS	Sig	NS	NS	NS
S × F	NS	NS	NS	NS	Sig	Sig.	Sig.	NS	Sig	Sig.	NS	NS
V × S × F	NS	NS	NS	NS	NS	Sig.	NS	NS	NS	Sig.	NS	NS
Y × V		Sig.		Sig.		Sig.						
Y × S		NS		Sig.		NS						
Y × F		NS		Sig.		NS						
Y × V × S × F		NS		Sig.		Sig.						

TABLE 7

Effect of different treatments on plant height (cm) cob height (cm)

Treatment	Plant height (cm)				Cob height (cm)			
Year	2014	2016	2017	Pooled	2014	2016	2017	Pooled
Main plot								
Variety (V)								
V_1 : CO 6	191	210	172	191	95	109	81	95
V_2 : HQPM 1	202	167	135	168	106	78	55	80
S. Em±	2.24	1.58	1.80	12.21	1.40	2.07	1.41	9.34
C. D. (P=0.05)	NS	4.98	5.68	NS	8.60	6.51	4.44	NS
C. V. (%)	5.9	4.4	6.1	5.2	7.2	11.4	10.7	9.9
Spacing (S)								
S_1 : 45 cm × 20 cm	215	185	156	185	116	92.1	71	93
S_2 : 60 cm × 20 cm	196	190	152	179	100	94.2	66	87
S_3 : 60 cm × 25 cm	179	191	153	174	87	95.5	66	83
S. Em±	2.42	1.94	2.21	6.40	1.60	2.53	1.73	4.99
C. D. (P=0.05)	7.0	NS	NS	NS	4.8	NS	NS	NS
Sub plot								
Fertilizer levels (NPK kg/ha)								
F_1 : 120:60:00	192	186	153	177	98	93.4	66	86
F_2 : 150:75:00	201	194	154	182	103	95.6	68	89
F_3 : 180: 90:00	197	186	155	179	101	92.8	69	88
S. Em±	2.42	1.44	1.48	1.06	1.60	0.92	1.37	0.77
C. D. (P=0.05)	7.00	4.19	NS	2.98	4.80	NS	NS	2.18
C. V. (%)	5.2	3.2	4.1	4.3	7.0	4.2	8.6	6.5
Interaction effect								
V × S	Sig	NS	NS	NS	Sig	NS	NS	NS
V × F	NS	Sig.	NS	NS	NS	NS	NS	NS
S × F	NS	Sig.	NS	NS	NS	Sig.	NS	NS
V × S × F	NS	Sig.	NS	NS	NS	Sig.	NS	NS
Y × V				Sig.				Sig.
Y × S				Sig.				Sig.
Y × F				NS				NS
Y × V × S × F				Sig.				Sig.

application of N was higher. The response of maize to higher nitrogen levels were reported by Wasnik *et al.* (2012). Bakht *et al.* (2006) recorded higher grain weight and grain yield at higher application at rate of 200kg/ha, biomass was increased with each incremental dose nitrogen. Sanjeev *et al.* (1997) reported that grain and fodder yield increased significantly due to nitrogen application. Srinkanth *et al.* (2009) reported significantly higher fodder yield at higher level of NPK (kg/ha). Mercy (2011) observed progressive and significant increment in fodder yield with each successive increase in nitrogen level. In addition, of nitrogen, phosphorus is one of the important factor influencing crop growth and yield of maize. The application of P shown to increase grain and fodder weight (Amanullah *et al.* 2010). Onasanya *et al.* (2009) reported in their study that different application rates of nitrogen and phosphorus fertilizer significantly improve maize growth and yield.

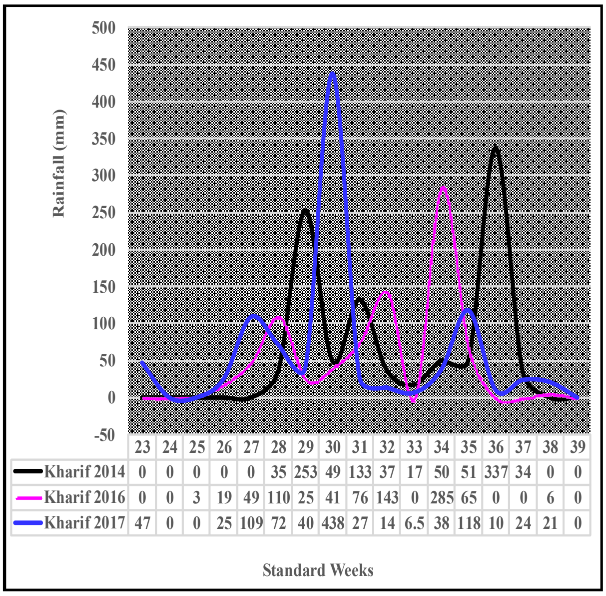

Fig. 1. Rainfall pattern of three experimentation year.

TABLE 8

Effect of different treatments on Number of kernel rows per cob and Number of kernels per row

Treatment	Number of kernels rows per cob				Number of kernels per row			
Year	2014	2016	2017	Pooled	2014	2016	2017	Pooled
Main plot								
Variety (V)								
V_1 : CO 6	12.0	13.3	12.3	12.7	28.0	27.4	27.4	27.8
V_2 : HQPM 1	12.0	12.7	11.8	12.3	28.0	27.7	27.8	28.0
S. Em±	0.18	0.07	0.15	0.16	0.13	0.61	0.46	0.26
C. D. (P=0.05)	NS	0.21	0.48	NS	NS	NS	NS	NS
C. V. (%)	7.6	2.69	6.59	5.21	2.4	11.4	8.6	8.4
Spacing (S)								
S_1 : 45 cm × 20 cm	12.0	12.7	11.9	12.4	27	27.5	26.0	26.8
S_2 : 60 cm × 20 cm	12.0	12.6	12.0	12.5	29	27.8	28.0	28.3
S_3 : 60 cm × 25 cm	12.0	13.7	12.1	12.8	29	27.4	28.7	28.6
S. Em±	0.18	0.08	0.19	0.21	0.46	0.74	0.56	0.55
C. D. (P=0.05)	NS	0.26	NS	NS	1.3	NS	1.77	1.59
Sub plot								
Fertilizer levels (NPK kg/ha)								
F_1 : 120 : 60 : 00	12.0	12.7	12.0	12.4	27.0	27.5	26.4	27.2
F_2 : 150 : 75 : 00	12.0	13.3	11.8	12.5	27.0	28.3	27.4	27.9
F_3 : 180 : 90 : 00	12.0	13.1	12.2	12.7	29.0	26.9	29.0	28.6
S. Em±	0.18	0.09	0.11	0.08	0.46	0.62	0.70	0.61
C. D. (P=0.05)	NS	0.25	NS	0.22	1.32	NS	2.05	NS
C. V. (%)	6.2	2.81	4.0	4.65	6.9	9.5	10.8	9.4
Interaction effect								
V × S	NS	Sig.	NS	NS	NS	NS	NS	NS
V × F	NS	Sig.	NS	NS	NS	NS	NS	NS
S × F	NS	NS	NS	NS	NS	NS	NS	NS
V × S × F	NS	Sig	NS	Sig	NS	NS	NS	NS
Y × V				Sig.				NS
Y × S				Sig.				NS
Y × F				NS				Sig.
Y × V × S × F				NS				NS

CONCLUSION

The hybrid maize (CO-6) gave higher grain and fodder yield and net return, under spacing of 60 cm × 20 cm and with fertilizer dose of 180:90:00 NPK/ha, when nitrogen applied in four splits *i.e.,* at basal (20%), four leaf stage (30%), eight leaf stage (40%) and tasseling stage (10%) where as P_2O_5 was applied as basal) during *kharif* season. Earlier, Sankaran *et al.* (2005) also reported the highest benefit cost ratio in treatment of 169 kg/ha nitrogen and 83333 plants density per ha. Similarly, Kar *et al.* (2006) reported highest net return and benefit cost ratio under spacing of 60 cm × 20 cm.

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