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Effect of Sowing Dates and Foliar Spray of Urea on Yield Attributes and Yield of Maize Cultivars

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A B S T R A C T

An experiment was conducted during *kharif* season of two consecutive years 2013 and 2014 at the Instructional Farm, Rajasthan College of Agriculture, MPUAT, Udaipur to evaluate the effect of sowing dates and foliar spray of urea on yield attributes and yield of maize cultivars. The experiment was conducted with two sowing dates with four cultivar (Pratap HQPM – 1, Bio – 9637, Pratap Makka – 3 and Pratap Makka – 5) and three foliar spray (2 % urea, 4 % urea and water spray). The experiment conducted in Split Plot Design (SPD) with three replications. The results showed that 25th June sown maize recorded significantly higher yield attributing characters *viz*. cobs plant^{-1}, grains cob^{-1} and 1000 grains weight as compared to 15th July sown maize. 25th June sown maize also gave significantly higher grain yield (4819 kg ha^{-1}), stover yield (8733 kg ha^{-1}), biological yield (13552 kg ha^{-1}) as compared to 15th July sown maize. Amongst the cultivars of maize, Pratap HQPM–1 gave highest cob length, cob girth, grains cob^{-1}, grains row cob^{-1}, 1000 grains weight, grain yield (5098 kg ha^{-1}) and harvest index (39.86 %). Whereas, Pratap Makka – 3 gave maximum stover yield (9009 kg ha^{-1}) as compared to other maize cultivars. Foliar spray of 4 % urea gave significantly higher 1000 grains weight and grain yield (4739 kg ha^{-1}) as compared to 2 % foliar spray of urea and water spray. Application of 4 % urea also gave significantly grains cob^{-1}, stover yield (8668 kg ha^{-1}) and biological yield (13407 kg ha^{-1}) as compared to water spray but found at par with 2 % foliar spray of urea.

Introduction

Maize or corn (*Zea mays*) is one of the most important cereal crops cultivated globally. Maize is also known as 'Queen' of cereals because it has the highest genetic yield potential among the cereals. Maize occupies an important place in India due to its high potential for yield and greater demand for food, feed and industrial utilization. In India maize is grown over an area of 9.4 million hectares with the production of 24.4 million tonnes in year 2013-14 and ranks as the third in food grain production (Economic Survey, 2015). Average productivity of maize in India is 2676 kg ha^{-1} and share of maize in total *kharif* food grain production is 16.62 per cent.

Maize is cultivated in almost all the states of India, but its extensive cultivation is confined to Karnataka, Andhra Pradesh, Maharashtra, Rajasthan, Tamil Nadu, Bihar, Uttar Pradesh,

Madhya Pradesh, and Gujarat. Rajasthan occupies an area of 8.91 lakh hectares with a production of 15.51 lakh tones and productivity of 1740 kg ha^{-1} (Agricultural Statistics, 2015). Rajasthan ranks 4th in maize with 7.74 per cent share in overall production in India.

Maize like many other crops that are cultivated in the tropics is influenced by the environmental changes (temperature, rainfall, sunshine, wind, etc.) associated with different sowing dates.

Each maize variety has an optimum sowing date, and the wider the deviation from the optimum sowing date, the greater the yield loss.

Considerable yield decline as a result of sowing too early or too late have been reported in maize Beiragi *et al.,* (2002). Khan *et al.,* (2011) observed a negative effect of delayed sowing on yield components of maize. They noted that delayed sowing resulted in reduced number of grains per row, 1000-grain weight and grain yield.

Meanwhile high demand of N-fertilizer requirement which led to high leaching of nitrogen fertilizer through its high filtration rates. However, application of N-fertilizer as urea foliar spray may decrease such losses.

El-Fouly and El-Sayed, (1995) reported that N-losses from the recommended N-dose for corn as a summer crop were 50% through leaching and /or denitrification. In this connection, El-Fouly and Fawzi, (1996) mentioned that N-losses in summer crops are very high and efficiency of N-fertilizers used is very low. The objective of the present study was to investigate the effect of sowing dates and foliar spray of urea on different maize cultivars.

Materials and Methods

The experiment was conducted during kharif season of 2013 and 2014 at Instructional Farm, Rajasthan College of Agriculture, MPUAT, Udaipur. The experimental site is situated in the step foot of Aravali hills at $24^0$35' N latitude and $72^0$42' E longitude and at an elevation of 582.17 m above mean sea level. This region falls under agro-climatic zone IV- a (Sub-humid Southern Plains and Aravali Hills) of Rajasthan.

The soil of experimental field was clay loam in texture, slightly alkaline in reaction and calcareous in nature. It was medium in nitrogen and phosphorus and rich in available potassium. The experiment was laid out in split plot design with three replications, assigning 24 treatments consisting of two date of sowing (25th June and 15th July), four varieties (Pratap HQPM – 1, Bio – 9637, Pratap Makka – 3 and Pratap Makka – 5) as main plot treatments and three foliar spray (2 % urea, 4 % urea and water spray) as sub plot treatment. The two foliar spray of urea (as per treatment) were applied at pre flowering stage and after 15 days of first spray. 2 and 4 % urea solution were prepared by dissolving 20 and 40 g urea per litre of water, respectively. Data with respect to yield and yield attributes were carefully recorded from randomly selected plants.

Results and Discussion

Yield attributes

Data (Table 1) showed that normal sown crop (25th June) registered significantly higher number of cobs $plant^{-1}$ over late sown crop during both the years and on pooled data basis. In pooled data, normal sown crop recorded higher number of cobs $plant^{-1}$ by 6.86 per cent over late sown (15th July) crop.

The number of cob plant^{-1} was not significantly affected by cultivars and foliar spray of urea. Results presented in Table 1 revealed that the date of sowing and foliar spray of urea did not influence cob length. The maximum cob length was recorded under cultivar Pratap HQPM – 1 (14.96, 15.18 and 15.07 cm) which was significantly superior over Bio – 9637 by 9.12, 8.90 and 9.04 per cent, Pratap Makka – 3 by 12.65, 12.11 and 12.38 per cent and Pratap Makka – 5 by 13.16, 13.71 and 13.39 per cent during 2013, 2014 and pooled basis, respectively. However, cultivar Bio – 9637 (13.71, 13.94 and 13.82 cm), Pratap Makka – 3 (13.28, 13.54 and 13.41 cm) and Pratap Makka – 5 (13.22, 13.35 and 13.29 cm) during 2013, 2014 and pooled basis, respectively were at par with each other.

Results (Table 1) showed that date of sowing and foliar spray of urea did not influence cob girth. But different cultivars of maize had significant variation in cob girth during both the years of the study. Maximum cob girth was recorded under cultivar Pratap HQPM – 1 (10.73 and 10.99 cm) which was significantly superior by 9.60 and 8.93 per cent during 2013, 9.35 and 9.57 per cent during 2014 over Pratap Makka – 3 and Pratap Makka – 5, respectively but found at par with Bio – 9637 during both the years. However, on pooled data, Pratap HQPM – 1 also registered significantly higher cob girth over Bio – 9637, Pratap Makka – 3 and Pratap Makka – 5 by 4.83, 9.48 and9.26 per cent, respectively. Bio – 9637 (10.23, 10.49 and 10.36 cm), Pratap Makka – 3 9.79, 10.05 and 9.92 cm) and Pratap Makka – 5 (9.85, 10.03 and 9.94 cm) were at par with each other in respect to cob girth during both the years and pooled basis, respectively.

Data (Table 1) indicates that 25th June sown crop produced higher number of grains cob^{-1} (403.26, 411.41and 407.33) which was significantly superior over 15th July sown maize by 6.48, 6.39 and 6.43 per cent during both the years and their pooled basis, respectively. Maximum number of grain cob^{-1} was recorded under cultivar Pratap HQPM – 1 (420.86 and 424.00) which was significantly superior over Bio – 9637 by 5.46 and 5.24 per cent, Pratap Makka – 3 by 14.13 and 14.48 per cent and Pratap Makka – 5 by 12.15 and 10.70 per cent during 2013 and on pooled basis. During 2014, Pratap HQPM – 1 also found superior over Pratap Makka – 3 and Pratap Makka – 5 by 14.83 and 9.31 per cent, respectively but found at par with Bio 9637.

As per pooled analysis, Bio 9637 produced higher number of grains cob^{-1} (402.31) which was significantly superior over Pratap Makka – 3 and Pratap Makka – 5 by 8.59 and 5.00 per cent, respectively. Pratap Makka – 3 and Pratap Makka – 5 were found at par with each other in respect to grains cob^{-1} during both the years and on pooled basis. Foliar spray of 4 % urea on maize produced maximum number of grains cob^{-1} (400.71, 409.53 and 405.12) which was significantly superior over water spray by 6.18, 7.09 and 6.64 per cent during 2013, 2014 and their pooled analysis, respectively but found at par with foliar spray of 2 % urea. Foliar spray of 2 % urea (394.89, 405.23 and 400.06) also found significantly superior over water spray by 4.64, 5.89 and 5.31 per cent during 2013, 2014 and their pooled analysis, respectively.

The date of sowing and foliar spray of urea had no significant effect on number of grain rows cob^{-1}. The highest number of grain rows cob^{-1} was recorded in cultivar Pratap HQPM – 1 (14.3, 14.6 and 14.5) which was significantly superior over Pratap Makka -3 (12.7, 12.9 and 12.8) and Pratap Makka – 5 (12.6, 12.7 and 12.7) but found at par with Bio – 9637 (13.1, 13.3 and 13.2) during 2013, 2014 and pooled analysis, respectively. Bio – 9637, Pratap Makka – 3 and Pratap Makka –

5 found at par with each other in respect to number of grain rows cob^{-1} (Table 2). The crop sown on 25th June was found significantly superior over 15th July sown crop by 9.23, 15.86 and 12.54 per cent during 2013, 2014 and pooled basis, respectively with respect to 1000 grain weight. The maximum 1000 grain weight was recorded under cultivar Pratap HQPM – 1 (200.71, 199.54 and 200.12) which was significantly superior over Pratap Makka – 3 (175.36, 184.35 and 179.86 g) and Pratap Makka – 5 (182.83, 187.52 and 185.17 g) but at par with Bio – 9637 (192.10, 1980.07 and 195.09 g) during both the years and their pooled analysis. As per pooled analysis, the per cent increase in 1000 grains weight of cultivar Pratap HQPM -1 was 11.26 and 8.07 over Pratap Makka – 3 and Pratap Makka – 5, respectively. Bio – 9637 also found significantly superior over Pratap Makka – 3 by 9.55, 7.44 and 8.47 per cent but at par with Pratap Makka – 5 during 2013, 2014 and their pooled analysis, respectively. Whereas, Pratap Makka – 5 and Pratap Makka – 3 found at par with each other during both the years and their pooled analysis. The foliar spray of urea had significant improvement in 1000 grains weight during both the years and pooled study. Maximum 1000 grains weight was recorded with 4 % foliar spray of urea which was found at par with 2 % foliar spray of urea during both the years and on pooled basis. Whereas, foliar spray of 2 % urea recorded significantly higher 1000 grain weight (188.83, 192.70 and 190.77) over water spray by 4.33, 5.09 and 4.72 per cent during 2003, 2014 and their pooled data, respectively (Table 2).

Data on 1000 grain weight presented in Table 3 show that there is a significant interaction among foliar spray and cultivars. Foliar spray of 4 % urea on Pratap HQPM – 1 gave maximum 1000 grain weight (211.12 g) which was significantly superior over water spray on Pratap HQPM – 1 by 13.70 per cent but found at par with 2 % foliar spray. Similarly, 4 % foliar spray in Bio – 9637 also found significantly superior over water spray by 12.33 per cent. Whereas, Pratap Makka – 3 and Pratap Makka - 5 did not affect by foliar spray of water and urea.

Under 2 % foliar spray of urea maximum 1000 grain weight (203.58 g) was recorded in Pratap HQPM – 1 which was significantly superior over Pratap Makka – 3 by 14.24 per cent but found at par with Bio – 9637 and pratap Makka – 5. Similarly, under 4 % foliar spray of urea maximum 1000 grain weight (211.12 g) was recorded in Pratap HQPM – 1 which was significantly superior over Pratap Makka – 3 and Pratap Makka – 5 by 14.37 and 13.34 per cent, respectively but found at par with Bio – 9637.

The marked improvement in various yield components of the crop seems to be on account of increased capacity of the normal sown crop to exploit environmental resources (above and below ground) for yield synthesis. Besides adequate supply of growth inputs (metabolites and nutrients), the congenial climatic conditions seems to have helped plants to exploit their potential for reproductive growth. It is well established that during reproductive phase, the inter-relationship between assimilation organ, storage sites and growing organs are complex and depend on environmental conditions particularly temperature, which is main driving force determining duration and rate of grain growth. (Fischer, 1984).The significant increase in 1000 grain weight under 25th June sown crop might be due to better uptake and translocation of photosynthetes during the reproductive phase of the crop, this increasing the size and weight of grains. Better expression of growth parameters and yield attributes might have contributed towards comparatively higher grain yield under 25th

June sown crop followed by 15th July sown crop. This view is close conformity with the findings of Aziz *et al.,* (2007), Feyzbakhsh *et al.,* (2015) and Sulochana *et al.,* (2015).

Yields

Table 4 showed that the date of sowing brought about significant variation in grain yield. Significantly higher grain yield was observed under 25th June sown maize (4765, 4872 and 4819 kg ha^{-1}) as compared to 15th July sown maize (4222, 4297 and 4259 kg ha^{-1}) by 12.86, 13.38 and 13.14 per cent during 2013, 2014 and in pooled data, respectively. Pratap HQPM – 1 recorded highest grain yield of 5006, 5190 and 5098 kg ha^{-1} which was significantly superior over Bio – 9637 (4604, 4735 and 4669 kg ha^{-1}), Pratap Makka – 3 (4141, 4158 and 4149 kg ha^{-1}) and Pratap Makka – 5 (4224, 4257 and 4240 kg ha^{-1}) during 2013, 2014 and their pooled basis, respectively. The magnitude of increases in grain yield of Pratap HQPM – 1 were in the order of 8.73, 20.88 and 18.51 per cent during 2013, 9.61, 24.82 and 21.92 per cent during 2014 and 9.19, 22.87 and 20.24 per cent on pooled basis over Bio – 9637, Pratap Makka - 3 and Pratap Makka – 5, respectively. During the year 2013, Bio – 9637 also gave significantly higher grain yield over Pratap Makka – 3 by 11.18 per cent but found at per with Pratap Makka – 5. Whereas, during 2014 and pooled analysis, Bio – 9637 gave significantly higher grain yield over Pratap Makka – 3 by 13.88 and 12.53 per cent and Pratap Makka – 5 by 11.22 and 10.12 per cent, respectively. Pratap Makka – 3 and Pratap Makka – 5 found at par with each other during 2013, 2014 and on pooled basis. Foliar spray of 4 % urea on maize produced highest grain yield (4679, 4799 and 4739 kg ha^{-1}) which was significantly superior over water spray by 9.19, 10.58 and 9.90 per cent during 2013, 2014 and their pooled analysis, respectively but found at par with foliar spray of 2 % urea. Foliar spray of 2 % urea (4516, 4615 and 4566 kg ha^{-1}) also found significantly superior over water spray by 5.39, 6.34 and 5.89 per cent during both the years and their pooled analysis, respectively.

A critical examination of data presented in Table 5 indicates that interaction effect of date of sowing, cultivars and foliar spray of water and urea was found significant on grain yield of maize. The maximum grain yield was recorded by 25th June sown Pratap HQPM – 1 with 4 % foliar spray of urea (5808 kg ha^{-1}) which was significantly superior over all other treatment combinations except 2 % foliar spray of urea on 25th June sown Pratap HQPM – 1 and 4 % foliar spray of urea on 25th June sown Bio – 9637. The minimum grain yield (3418 kg ha^{-1}) was recorded under 15th July sown Pratap Makka – 3 with 2 % foliar spray of urea.

25th June sown crop produced higher stover yield (8617, 8850 and 8733 kg ha^{-1}) which was significantly superior over 15th July sown maize by 8.14, 10.75 and 9.42 per cent during both the years and their pooled basis, respectively. Amongst cultivars, highest stover yield was recorded under Pratap Makka – 3 (8909, 9109 and 9009 kg ha^{-1}) which was significantly superior over Pratap HQPM – 1 by 15.94, 18.13 and 17.03 per cent and Bio – 9637 by 12.25, 11.80 and 12.02 per cent but at par with Pratap Makka – 5 during 2013, 2014 and on pooled basis, respectively. As per pooled analysis, Pratap Makka – 5 (8681 kg ha^{-1}) also found significantly superior over Pratap HQPM – 1 and Bio – 9637 by 12.77 and 7.95 per cent, respectively. Whereas, Pratap Makka – 3 and Pratap Makka – 5 found at par with each other during both the years and on pooled basis. Maximum stover yield was observed by 4 % foliar spray of urea (8584, 8752 and 8668 kg ha^{-1}) which was significantly superior by 8.49, 9.80 and 9.14 per cent over water spray

but found at par with 2 % foliar spray of urea during 2013, 2014 and their pooled basis, respectively. 2 % foliar spray of urea (8384, 8539 and 8462 kg ha^{-1}) was also found significantly superior over water spray by 5.95, 7.13 and 6.55 per cent during both the years and their pooled analysis.

Data (Table 6) showed that interaction effect between date of sowing and cultivars was found significant for stover yield. Maximum stover yield was recorded in cultivar Pratap Makka – 5 sown under 25th June (9227 kg ha^{-1}) which was significantly superior over that sown under 15th July by 13.42 per cent. Similarly, 25th June sown Bio – 9637 (8800 kg ha^{-1}) also gave significantly higher stover yield over that sown at 15th July. However, no significant effect of date of sowing was observed in Pratap HQPM – 1 and Pratap Makka – 3.

Pratap Makka – 5 sown under 25th June recorded maximum stover yield (9227 kg ha^{-1}) which was significantly superior over Pratap HQPM – 1 by 19.20 per cent but found at par with Bio – 9637 and Pratap Makka – 3. Similarly, Pratap Makka – 3 and Bio – 9637 also found significantly superior over HQPM – 1 by 18.38 and 13.68 per cent, respectively. Bio – 9637, Pratap Makka – 3 and Pratap Makka – 5 found statistically at par with each other when sown on 25th June. Whereas, under 15th July sowing date, Pratap Makka – 3 (8854 kg ha^{-1}) recorded higher stover yield which was significantly superior over Pratap HQPM – 1, Bio – 9637, and Pratap Makka – 5 by 15.68, 21.57 and 8.84 per cent, respectively. Pratap Makka – 5 (8135 kg ha^{-1}) sown at 15th July also gave significantly higher stover yield over Bio - 9637 but found at par with Pratap HQPM – 1.

Date of sowing brought about significant variation in biological yield. Significantly higher biological yield was observed under 25th June sown maize (13382, 13722 and 13552 kg ha^{-1}) which was significantly superior over 15th July sown maize by 9.75, 11.66 and 10.71 per cent during both the years and for pooled data, respectively. The maximum biological yield was observed by cultivar Pratap Makka – 3 (13050, 13266 and 13158 kg ha^{-1}) followed by Pratap Makka – 5 (12869, 12973 and 12921 kg ha^{-1}), Pratap HQPM– 1(12690, 12901 and 12795 kg ha^{-1}) and Bio – 9637 (12541, 12880 and 12711 kg ha^{-1}) but found at par with each other cultivars during both the years and their pooled analysis, respectively. Maximum biological yield was recorded with 4 % foliar spray of urea (13264, 13550 and 13407 kg ha^{-1}) which was found at par with 2 % foliar spray of urea during both the years and on pooled basis. However, foliar spray of 2 % urea record significantly higher biological yield (12901, 13154 and 13028 kg ha^{-1}) over water spray by 5.76, 6.85 and 6.32 per cent during 2013, 2014 and their pooled data, respectively.

Table 7 showed that interaction effect between date of sowing and cultivars was found significant for biological yield. The maximum biological yield was recorded in cultivar Pratap Makka – 3 sown under 25th June (13868 kg ha^{-1}) which was significantly higher over that sown under 15th July by 11.41 per cent. Similar results were also found for Pratap Makka – 5 and Bio – 9637 when change the date of sowing. But no significant effect of date of sowing was observed in Pratap HQPM – 1. Pratap Makka – 3 sown under 25th June recorded maximum biological yield which was significantly at par with all other cultivars sown at 25th June. Whereas, under 15th July sowing date, Pratap HQPM – 1 (12555 kg ha^{-1}) recorded maximum biological yield which was significantly superior over Bio – 9637 by 7.66 per cent but found at par with Pratap Makka – 3 and Pratap Makka – 5.

Table.1 Effect of date of sowing, cultivars and foliar spray of urea on yield attributes of maize

Treatment	Yield attributes								
	Number of cobs plant^{-1}			Cob length (cm)			Cob girth (cm)		
	2013	2014	Pooled	2013	2014	Pooled	2013	2014	Pooled
Date of Sowing									
25th June	1.08	1.11	1.09	13.85	14.09	13.97	10.24	10.50	10.37
15th July	1.00	1.04	1.02	13.73	13.91	13.82	10.07	10.28	10.17
SEm ±	0.02	0.02	0.01	0.28	0.28	0.20	0.15	0.17	0.11
CD (P=0.05)	0.05	0.07	0.04	NS	NS	NS	NS	NS	NS
Cultivars									
Pratap HQPM – 1	1.06	1.11	1.09	14.96	15.18	15.07	10.73	10.99	10.86
Bio – 9637	1.05	1.11	1.08	13.71	13.94	13.82	10.23	10.49	10.36
Pratap Makka – 3	1.02	1.02	1.02	13.28	13.54	13.41	9.79	10.05	9.92
Pratap Makka – 5	1.02	1.05	1.03	13.22	13.35	13.29	9.85	10.03	9.94
SEm ±	0.02	0.03	0.02	0.40	0.39	0.28	0.21	0.24	0.15
CD (P=0.05)	NS	NS	NS	1.21	1.19	0.81	0.64	0.72	0.46
Foliar Spray									
2 % Urea	1.04	1.08	1.06	13.76	13.99	13.88	10.17	10.49	10.33
4 % Urea	1.06	1.10	1.08	13.86	14.08	13.97	10.20	10.45	10.32
Water Spray	1.02	1.04	1.03	13.75	13.93	13.84	10.08	10.23	10.15
SEm ±	0.02	0.03	0.02	0.28	0.31	0.21	0.14	0.16	0.11
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table.2 Effect of date of sowing, cultivars and foliar spray of urea on yield attributes of maize

Treatment	Yield attributes								
	Number of grains cob^{-1}			Number of grains row cob^{-1}			1000 grain weight (g)		
	2013	2014	Pooled	2013	2014	Pooled	2013	2014	Pooled
Date of Sowing									
25th June	403.26	411.41	407.33	13.2	13.5	13.4	196.03	206.51	201.27
15th July	378.72	386.70	382.71	13.1	13.3	13.2	179.47	178.24	178.85
SEm ±	4.57	5.77	3.68	0.3	0.3	0.2	2.96	2.86	2.06
CD (P=0.05)	13.85	17.51	10.66	NS	NS	NS	8.97	8.66	5.96
Cultivars									
Pratap HQPM – 1	420.86	427.42	424.14	14.3	14.6	14.5	200.71	199.54	200.12
Bio – 9637	399.08	405.54	402.31	13.1	13.3	13.2	192.10	198.07	195.09
Pratap Makka – 3	368.75	372.22	370.48	12.7	12.9	12.8	175.36	184.35	179.86
Pratap Makka – 5	375.28	391.03	383.15	12.6	12.7	12.7	182.83	187.52	185.17
SEm ±	6.46	8.16	5.21	0.4	0.4	0.3	4.18	4.04	2.91
CD (P=0.05)	19.59	24.77	15.08	1.3	1.2	0.8	12.69	12.25	8.42
Foliar Spray									
2 % Urea	394.89	405.23	400.06	13.1	13.4	13.3	188.83	192.70	190.77
4 % Urea	400.71	409.53	405.12	13.2	13.5	13.4	193.42	201.04	197.23
Water Spray	377.37	382.40	379.88	13.1	13.3	13.2	180.99	183.37	182.18
SEm ±	5.74	6.81	4.46	0.3	0.3	0.2	2.52	2.82	1.89
CD (P=0.05)	16.54	19.63	12.59	NS	NS	NS	7.26	8.11	5.34

Table.3 Interaction effect of cultivars and foliar spray on 1000 grain weight (pooled)

Foliar spray of urea	Cultivars				
	Pratap HQPM – 1	Bio – 9637	Pratap Makka – 3	Pratap	Makka – 5
2 % Urea	203.58	194.08	178.20	187.21	
4 % Urea	211.12	206.95	184.60	186.27	
Water Spray	185.68	184.23	176.77	182.04	
			SEm±	CD (P=0.05)	
Same foliar spray for different cultivars			6.30	18.08	
Same cultivars for different foliar spray			5.34	15.10	

Table.4 Effect of date of sowing, cultivars and foliar spray of urea on grain, stover and biological yield of maize

Treatment	Yields (kg ha^{-1})								
	Grain			Stover			Biological		
	2013	2014	Pooled	2013	2014	Pooled	2013	2014	Pooled
Date of Sowing									
25th June	4765	4872	4819	8617	8850	8733	13382	13722	13552
15th July	4222	4297	4259	7971	7991	7981	12193	12289	12241
SEm ±	90	93	65	108	131	85	127	161	102
CD (P=0.05)	274	282	188	326	397	246	384	487	296
Cultivars									
Pratap HQPM – 1	5006	5190	5098	7684	7711	7698	12690	12901	12795
Bio – 9637	4604	4735	4669	7937	8146	8042	12541	12880	12711
Pratap Makka – 3	4141	4158	4149	8909	9109	9009	13050	13266	13158
Pratap Makka – 5	4224	4257	4240	8645	8717	8681	12869	12973	12921
SEm ±	128	132	92	152	185	120	179	227	145
CD (P=0.05)	387	399	266	462	562	347	NS	NS	NS
Foliar Spray									
2 % Urea	4516	4615	4566	8384	8539	8462	12901	13154	13028
4 % Urea	4679	4799	4739	8584	8752	8668	13264	13550	13407
Water Spray	4285	4340	4312	7913	7971	7942	12198	12311	12254
SEm ±	78	116	70	154	173	116	176	217	140
CD (P=0.05)	225	335	198	444	499	328	507	624	394

Table.5 Interaction effect of date of sowing, cultivars and foliar spray on grain yield of maize (pooled)

Cultivars	Grain yield (kg ha^{-1})							
	25th June				15th July			
	Pratap HQPM – 1	Bio – 9637	Pratap Makka – 3	Pratap Makka – 5	Pratap HQPM – 1	Bio – 9637	Pratap Makka – 3	Pratap Makka – 5
2 % Urea	5382	4948	4714	4347	4912	4419	3418	4387
4 % Urea	5808	5162	4858	4291	4997	4936	3627	4236
Water Spray	4693	4852	4539	4233	4795	3698	3740	3949

	SEm±	CD (P=0.05)
Same cultivars for different date of sowing	212	607
Same date of sowing for different cultivars	380	792

Table.6 Interaction effect of date of sowing and cultivars on stover yield (kg ha^{-1}) of maize (pooled)

Cultivars	Date of sowing	
	25th June	15th July
Pratap HQPM – 1	7741	7654
Bio – 9637	8800	7283
Pratap Makka – 3	9164	8854
Pratap Makka – 5	9227	8135
	SEm±	CD (P=0.05)
Same cultivars for different date of sowing	254	726
Same date of sowing for different cultivars	240	694

Table.7 Interaction effect of date of sowing and cultivars on biological yield (kg ha^{-1}) of maize (pooled)

Cultivars	Date of sowing	
	25th June	15th July
Pratap HQPM – 1	13036	12555
Bio – 9637	13788	11634
Pratap Makka – 3	13868	12448
Pratap Makka – 5	13517	12326
	SEm±	CD (P=0.05)
Same cultivars for different date of sowing	306	875
Same date of sowing for different cultivars	289	838

Yields are directly related to yield attributes. Thus, higher grain yield could be ascribed to the fact that yield of the crop is a function of yield attributes which are dependent on complementary interactions between vegetative and reproductive growth of the crop.

Their overall effects reflect in the form of yield.This view is close conformity with the findings of Aziz *et al.,* (2007), Feyzbakhsh *et al.,* (2015) and Sulochana *et al.,* (2015).

On the basis of present study it could be concluded that under prevailing agroclimatic conditions, maize cultivar Pratap HQPM – 1 sown on 25th June with 4 % foliar spray gave maximum grain yield (5808 kg ha^{-1}).

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