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Effect of Sowing Methodology on Diverse Hybrid Maize (*Zea mays* L.) Cultivars in Two Contrasting Environments

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A B S T R A C T

A field experiment was conducted to identify best sowing methodology for different maize hybrids in two contrasting environments i.e. spring and kharif, 2017 at Lovely Professional University, Phagwara. In this experiment three factors, Season, varieties and flat/ridges sowing technique were studied as main, sub and sub-sub factors in split plot design with three replications and six popular hybrids. The data was recorded for Plant height, cob height (cm), cob length (cm), Cob breadth (cm), Number of cobs/plot, Grain yield, cob weight/plot, Stubble weight, Harvest index%. Relatively high magnitude of variation was observed for most of character from spring and kharif season. Among ridge/flat sowing methodology, it was found ridge sowing is better performed as compared to flat sowing in both seasons and most of hybrids (DKC9108 and Pioneer 1844). Similarly, DKC 9108 and Pioneer 1844 performed better in interactions of hybrids and sowing on different methods in term grain yield. Looking for both seasons, kharif season performed superior as compared spring season.

Introduction

Maize (*Zea mays* L.) is an important cereal crop and ranks third in production after wheat and rice in India. It is a plant is belongs to the family of grasses (Poaceae). It is cultivated globally one of most important cereal crop worldwide. It is called a queen of cereals. Maize is one of the world's leading crops cultivated over an area of about 139 mha with a production of about 600 mha of grain. Among the maize growing countries, USA has the largest area followed by Brazil, China, Mexico and India. In respect of production also USA stands first followed by China. In India, area, production and productivity of maize is 9.43 mha, 24.35 mha and 25.57q/ha respectively. In Punjab, area, production and productivity of maize is 0.13 mha, 0.50 mha and 36.8 q/ha (Anonymous 2015 -16). Maize grain contains about 10 per cent protein, 4 per cent oil, 70 per cent carbohydrate, 2.3 per cent crude fiber, 10.4 per cent albuminoides, 1.4 per cent ash (Panchanathan *et al.*, 2013). It can be helpful to crop body weight and milk quality in cattle due to higher nutrients value (chaudary*et al*, 2016). Over 85% of maize produced in the country is consumed as

human food. A variety of products such as starch, corn syrup, alcohol, acetic acid, glucose, lactic acid, paper, rayon, plastic, textile, corn oil, soaps, adhesive, dye, synthetic rubber and resin are produced form maize. Maize crop yields huge tonnage of green fodder, a good feed poultry, piggery and milch animals Maize crop based on the grain consumption different types of such as dent, flint, pop, pod, sweet, floury and waxy maize are suitable for specific usages. Among the different types of maize as sweet corn is most popular as green cobs. Maize grain consumption in boiled grains and vegetable purpose, it is also used for extracting sucrose as an industrial purpose. It is very profitable for rural farmers due to high cost of green cobs. It gives good return to the farmers and green stalk used as fodder.In Punjab maize grown in Rabi, Kharif and Spring seasons. Sowing of maize crop in many different methods like Dibbling, drilling and broadcasting in flat and ridges. Different planting methods including flat sowing, ridge sowing are employed for maize.

Materials and Methods

Experimental detail

This chapter includes the outlines of methodologies of experiment ‘‘Effect of sowing methodology on diverse hybrid maizecultivars in two contrasting environments.” This was conducted at the research farms of Lovely Professional University, Phagwara, Punjab. During Spring and Kharif season of 2017-2018:The experiment was conducted at LPU field, School of Agriculture, Lovely Professional University, Phagwara, Punjab, during 2017-2018.: The experiment site is in sub-tropical region and has weather condition with hot summer and cool winters. The average temperature was 25-28˚c at the crop growth stages which was optimum for crop growth and development. In experiment 6 treatments and three replications were used by split plot design. Six different hybrids were used viz namely Pioneer 1844, DKC 9108, DOW 2244, Rasi 4558, Kaveri 4210, Pioneer 1855. 8-10 kg seed rate per acre was used and sowing was done by flat and ridge sowing in two different spring and kharif seasons. Plant to plant 20 cm distance and row to row 60 cm. the seed was sown about approximately depth of 4-6 cm. DAP was added in soil before the sowing of crop. Nitrogen was applied as basal dose as per treatment and remaining nitrogen in split doses at different critical stages of growth.

Results and Discussion

Plant height

Effect of between seasons, hybrids and sowing on different methods (flat/Ridges) on plant height (cm)

The comparison between seasons, hybrids and sowing on different methods (flat/Ridges) has been observed for plant height. The performance of hybrids in kharif season was higher as compared to spring season. During kharif season average height (222.09cm) and spring season average height (193.40cm). DKC 9108 (228.5cm) is performed superior as compared to other in kharif season and DKC 9108 (202.8cm) performed better in spring season. Among ridge/flat sowing methodology it was found that ridge sowing (213.53cm) is better perform as compared to flat sowing (202.95cm) in kharif season. At spring season Ridge sowing (212.96cm) is better performed as compared to flat sowing (201.56). Across hybrid even though these were significantly different from each other (as per ANOVA analysis).

Effect of season and hybrids on plant height

The comparison between season and hybrids has been observed for plant height. Looking at both of season has been observed for plant

height in which kharif season (222.09cm**) performed the better than spring season (193.40). DKC 9108 (228.5cm**) was performed superior as compared to other in kharif season and DKC 9108 (202.8cm) was performed better in spring season. Across hybrids Even though these were significantly different from each other (as per ANOVA analysis at 5% and 1% level of significance).

Effect of season and sowing on different methods (Flat/Ridges) on plant height

The comparison between season and sowing on different methods (Flat/Ridges) has been observed plant height. The performance of hybrids in kharif season was higher as compared to spring season. kharif season average height (222.09cm**) and at spring season average height (193.40cm**). Among Ridge/Flat sowing methodology it was found that Ridge sowing (213.53cm**) is better performed as compared to flat sowing (202.95cm) in kharif season. In spring season ridge sowing height (212.96cm) and flat sowing height (201.56cm). Across hybrids even though these were significantly different from each other (as per anova analysis as per 5% and 1% level of significance).

Effect of hybrids and sowing on different methods (flat/ridges) on plant height (cm)

The comparison between hybrids and sowing on different methods (flat/ridges). DKC 9108 performed superior than all the other hybrids has been observed for plant height in both season.

In comparison with DKC 9108(215.65cm) with other hybrids performed in followed by DOW 2244(211.77cm),Pioneer 1844(207.35cm), Pioneer 1855(206.78cm), Rasi 4558(203.6cm), kaveri 4210(201.32cm) has been observed for plant height. Among Ridge/flat sowing methodology it was found that Ridge sowing is performed superior as compared to flat sowing in both seasons. In kharif season average height at ridge sowing (213.53cm) and flat sowing average height (202.95cm) and in spring season average height at ridge sowing (212.96cm) and flat sowing average height (201.56cm). Across hybrids even though these were significantly different from each other (as per ANOVA analysis as per 5% and 1% level of significance).

Cob length

Effect of seasons, hybrids and sowing on different methods (flat/Ridges) on cob length (cm)

The comparison between seasons, hybrids and sowing on different methods (flat/Ridges) has been observed for cob length. The performance of hybrids in Kharif season is superior as compared to spring season. During kharif season average length (16.04cm) and spring season average length (15.75cm). Pioneer 1855 (17.53 cm) is performed superior as compared to other in Kharif season sowing in ridges and DKC 9108 (16.73cm) better in spring season sowing in ridges. Among ridge/flat sowing methodology it was found that ridge sowing (16.40cm) is better perform as compared to flat sowing (16.06cm). Across hybrids even though these were non significantly different from each other (as per ANOVA analysis).

Effect of season and hybrids on cob length (cm)

The comparison between season and hybrids has been observed for cob length. Looking at both of season in length of cobs. During kharif season average length (16.04cm) performed the better than spring season average length (15.75cm). Pioneer 1844 (16.85cm) was performed superior as compared to other in

kharif season and DKC 9108 (16.15cm) was performed better in spring season. Across hybrids even though these were non significantly different from each other (as per ANOVA analysis).

Effect of season and sowing on different methods (Flat/Ridges) on cob length (cm)

The comparison between season and sowing on different methods (Flat/Ridges) has been observed for cob length. kharif season is performed superior as compared to spring season. During kharif season average length (16.04 cm) and at spring season average length (15.75cm). Among Ridge/Flat sowing methodology it was found that Ridge sowing is better performed as compared to flat sowing has been observed for cob length. Across hybrids even though these were non significantly different from each other (as per ANOVA analysis).

Effect of hybrids and sowing on different methods (flat/ridges) on cob length

The comparison between hybrids and sowing on different methods (flat/ridges). DOW 2244 performed superior than all the other hybrids has been observed for length of cobs. The comparison with DOW 2244(16.16cm) variety with other varieties performed in followed by Pioneer1844(16.16cm),DKC9108(16.15cm),Pioneer1855(15.85cm), Rassi 4558(15.67cm), Kaveri 4210(15.39cm) has been observed for length of cobs in cm. Ridge sowing is performed superior as compared to flat sowing in both seasons.

During kharif season average length at ridge sowing (16.40cm) and flat sowing average length (15.69cm). During spring season average value at ridge sowing (16.06cm) and flat sowing (15.44cm). Across hybrids even though these were non significantly different from each other (as per ANOVA analysis).

Number of cobs

Effect of seasons, hybrids and sowing on different methods (flat/Ridges) on number of cobs

The comparison between seasons, hybrids and sowing on different methods (flat/Ridges) has been observed for number of cobs. The performance of hybrids in kharif season was higher as compared to spring season. During kharif season average cobs (33.44) and spring season average cobs (24.89). Pioneer 1855 (39) is performed superior as compared to other in kharif season sowing and Rasi 4558 (29.16) performed better in spring season. Among ridge/flat sowing methodology it was found that ridge sowing (30.80 cobs) is better perform as compared to flat sowing (25.22cobs). Across hybrids even though these were significantly different from each other (as per ANOVA analysis).

Impact of season and hybrids on number of cobs

The comparison between season and hybrids has been observed for number of cobs. Looking at both of season has been observed for number of cobs. The performance of hybrids in kharif season (33.44 cobs) is higher as compared to spring season (24.77 cobs). Pioneer 1855 (39.5*cobs) was performed superior as compared to other in kharif season and Rasi 4558 (29.16 cobs) was performed better in spring season. Across hybrids even though these were significantly different from each other (as per ANOVA analysis at 5% level of significance).

Effect of season and sowing on different methods (Flat/Ridges) on number of cobs

The comparison between season and sowing on different methods (Flat/Ridges) has been observed for number of cobs. The

performance of hybrids in kharif season is performed superior as compared to spring season. During kharif season average cobs (33.44 cobs) and spring season average cobs (24.77cobs). Among Ridge/Flat sowing methodology it was found that Ridge sowing (30.80 cobs) is better performed as compared to flat sowing (25.22cobs) in kharif season and spring season ridge sowing value (33.36 cobs) and flat sowing were (27.05cobs). Across hybrids even though these were significantly different from each other (as per analysis 5% level of significance).

Effect of hybrids and sowing on different methods (flat/ridges) on number of cobs

The comparison between hybrids and sowing on different methods (flat/ridges). Pioneer 1855 performed superior than all the other varieties has been observed for number of cobs in both season. A comparison with Pioneer 1855(32.45 cobs) variety other varieties performed in followed by Rasi 4558(30.04 cobs), DKC 9108(29.5cobs), Pioneer1844(27.91cobs), kaveri 4210 (27.87cobs), DOW 2244(26.87cobs) has been observed number of cobs. Among Ridge/flat sowing methodology it was found that Ridge sowing is performed superior as compared to flat sowing in both seasons. In kharif season average cobs at ridge sowing (33.36cobs) and flat sowing average cobs (27.05cobs). In spring season average cobs at ridge sowing (30.80cobs) and flat sowing average (25.22cobs). Across hybrids even though these were significantly different from each other (as per ANOVA analysis).

Grain weight

Effect of seasons, hybrids and flat/ridges on Grain yield (q/ha) in kharif

The comparison between seasons, varieties and sowing on different methods (flat/Ridges) has been studied for grain yield per hectare. The performance of hybrids in Kharif season was higher as compared to spring season. During kharif season average grain yield (40.27q/h) and spring season average grain yield (39.41 q/ha). DKC 9108 (67.15q/ha) is performed superior as compared to other in Kharif season and Pioneer 1855 (53.06q/ha) performed better in spring season. Among ridge / flat sowing methodology, it was found that ridge sowing (47.33q/ha) is better as compared to flat sowing (33.48q/ha) across hybrids even though these were non-significant different from each other (as per ANOVA analysis)

Effect of seasons and hybrids on grain yield (q/ha)

The comparison between season and hybrids has been of Grain weight. Looking at both of season has observed grain weight. The performance of hybrids in kharif season performed the better than spring season. DKC 9108 (49.51 q/ha) was performed superior as compared to other in kharif season and Pioneer 1844 (43.78 q/ha) was performed better in spring season. Across hybrids even though these were non significantly different from each other (as per ANOVA analysis).

Effect of season and sowing methods (flat/ridges) on grain yield (q/ha)

The comparison between season and sowing on different methods (Flat/Ridges). The performance of hybrids in kharif season was superior as compared to spring season. During kharif season average yield (40.27 q/ha) and spring season average yield (39.41 q/ha). Among Ridge sowing and Flat sowing methodology it was found that Ridge sowing is better performed as compared to flat sowing has been observed grain weight. Across hybrids even though these were non significantly different from each other (as per ANOVA analysis).

Table.1 Effect of between seasons, hybrids and sowing on different methods (flat/Ridges) on plant height

	Kharif							Sprin						
	Pio 1855	**DKC 9108**	**Dow 2244**	**Kaveri 4210**	**Rasi 4558**	**Pio 1844**		**Pio 1855**	**DKC 9108**	**Dow 2244**	**Kaveri 4210**	**Rasi 4558**	**Pio 1844**	**Mean**
Ridge (kharif)	231*	234*	238.6*	235.2*	218.6	221.8		202.4	204	210	183	187	196.8	213.53*
Flat (kharif)	224.6*	212.8	200	201	225	200.8		190.9	206	197	196	193	188	202.92
Ridge (spring)	219.4*	231.4*	234.2*	230.4	239	228.6		196.8	200	201.2	196	195	183.6	212.96*
Flat (spring)	202	235.8*	234*	200	201.4	230.6		187.2	201.2	179.2	169	169.8	208.6	201.56
Mean	219.25*	228.5*	226.7	216.65*	221*	220.45*		194.32	202.8	196.85	186	186.2	194.25	207.74

Effect of season and hybrids on plant height

	Pio 1855	DKC 9108	Dow 2244	Kaveri 4210	Rasi 4558	Pio 1844	Mean
Kharif	219.25	228.5**	226.7**	216.65	221*	220.45*	222.09**
Spring	194.32*	202.8	196.85	186**	186.2**	194.25*	193.40
Mean	206.78	215.65	211.77	201.32	203.6	207.35	207.74

Effect of season and sowing on different methods (Flat/Ridges) on plant height

	Ridge (kharif)	Flat (kharif)	Ridge (spring)	Flat (spring)	Mean
Kharif	229.86**	210.7	230.5**	217.3*	222.09**
Spring	197.2	195.15*	195.43*	185.83**	193.40**
Mean	213.53**	202.92	212.96	201.56	207.74

Effect of hybrids and sowing on different methods (flat/ridges) on plant height

	Ridge (kharif)	Flat (kharif)	Ridge (spring)	Flat (spring)	Mean
Pio 1855	216.7*	207.75	208.1	194.6	206.78
DKC 9108	219*	209.4	215.7	218.5*	215.65*
Dow 2244	224.3*	198.5	217.7	206.6	211.77*
Kaveri 4210	209.1	198.5	213.2	184.5	201.32
Rasi 4558	202.8	209	217	185.6	203.6
Pio 1844	209.3	194.4	206.1	219.6*	207.35
Mean	213.53*	202.92	212.96*	201.56	207.74

Table.2 Effect of seasons, hybrids and sowing on different methods (flat/Ridges) on cob length

	Kharif						Spring						
	Pio 1855	**DKC 9108**	**Dow 2244**	**Kaveri 4210**	**Rasi 4558**	**Pio 1844**	**Pio 1855**	**DKC 9108**	**Dow 2244**	**Kaveri 4210**	**Rasi 4558**	**Pio 1844**	**mean**
Ridge (spring)	16.9	16.7	17.067	16.4	15.733	16.833	15.4	15.667	16.333	15.867	17.8	16.2	16.40833
Flat (spring)	14.6	16.133	15.433	16.6	15.75	16.3	15.033	15.4	16.467	15.467	15.4	15.733	15.693
Ridge (Kharif)	17.533	15.533	16.867	15.567	16.1	16.467	15.933	16.733	15.667	15.267	15.6	15.467	16.06117
Flat (Kharif)	15.4	16.267	15.633	13.533	13.933	17.8	16	16.833	15.867	14.433	15.067	14.533	15.44158
mean	16.10825	16.15825	16.25	15.525	15.379	16.85	15.5915	16.15825	16.0835	15.2585	15.96675	15.48325	

Effect of season and hybrids on cob length

	Pio 1855	DKC 9108	Dow 2244	Kaveri 4210	Rasi 4558	Pio 1844	Mean
Kharif	16.10	16.15	16.25	15.52	15.37	16.85	16.04
Spring	15.59	16.15	16.08	15.25	15.96	15.48	15.75
Mean	15.85	16.15	16.16	15.39	15.67	16.16	15.90

Effect of season and sowing on different methods (Flat/Ridges) on cob length

	Ridge (kharif)	Flat (kharif)	Ridge (spring)	Flat (spring)	Mean
Kharif	16.60	15.80	16.34	15.42	16.04
Spring	16.21	15.58	15.77	15.45	15.75
Mean	16.40	15.69	16.06	15.44	

Effect of hybridsand sowing on different methods (flat/ridges) on cob length

	Ridge (kharif)	Flat (kharif)	Ridge (spring)	Flat (spring)	Mean
Pio 1855	16.15	14.81	16.73	15.7	15.85
DKC 9108	16.18	15.76	16.13	16.55	16.15
Dow 2244	16.7	15.95	16.26	15.75	16.16
Kaveri 4210	16.13	16.03	15.41	13.98	15.39
Rasi 4558	16.76	15.57	15.85	14.5	15.67
Pio 1844	16.51	16.01	15.96	16.16	16.16
Mean	16.40	15.69	16.06	15.44	

Table.3 Effect of seasons,hybrids and sowing on different methods (flat/Ridges) on number of cobs

	Kharif							Spring						
	Pio 1855	**DKC 9108**	**Dow 2244**	**Kaveri 4210**	**Rasi 4558**	**Pio 1844**		**Pio 1855**	**DKC 9108**	**Dow 2244**	**Kaveri 4210**	**Rasi 4558**	**Pio 1844**	**Mean**
Ridge (kharif)	39.66*	44.3*3	35.33*	36*	26	29.33		28.66	21.66	25	26.66	24.66	32.33	30.80
Flat (kharif)	35.66*	31.66	20.33	29	32.66	29		20.33	17	11	20.33	38	17.66	25.22
Ridge (spring)	46.33*	39.66*	41.66*	40.33*	36.66*	27.33		28.66	21.33	31.66	23	31.33	32.33	33.36
Flat (spring)	36.33*	30.66	24	30	28.33	32.33		24	29.66	26	17.66	22.66	23	27.05
Mean	39.5	36.58	30.33	33.83	30.91	29.49		25.41	22.41	23.41	21.91	29.16	26.33	29.11

Effect of season and hybrids on number of cobs

	Pio 1855	DKC 9108	Dow 2244	Kaveri 4210	Rasi 4558	Pio 1844	Mean
Kharif	39.5*	36.58	30.33	33.83	30.91	29.5	33.44
Spring	25.41	22.41	23.41	21.91	29.16	26.33	24.77
Mean	32.45	29.5	26.87	27.87	30.04	27.91	29.11

Effect of season and sowing on different methods (Flat/Ridges) on number of cobs

	Ridge (kharif)	**Flat (kharif)**	**Ridge (spring)**	**Flat (spring)**	**Mean**
Kharif	35.11	29.72	38.66**	30.27	33.44
Spring	26.5	20.72	28.05	23.83	24.77
Mean	30.80	25.22	33.36	27.05	29.11

Effect of hybrids and sowing on different methods (flat/ridges) on number of cobs

	Ridge (Kharif)	Flat (Kharif)	Ridge (spring)	Flat (spring)	Mean
Pio 1855	37.5*	30.16	34.16*	28	32.45
DKC 9108	30.5	30.16	33	24.33	29.5
Dow 2244	36.66*	25	30.16	15.66*	26.87
Kaveri 4210	31.66	23.83	31.33	24.66	27.87
Rasi 4558	34*	25.5	25.33	35.33	30.04
Pio 1844	29.83	27.66	30.83	23.33	27.91
Mean	33.36	27.05	30.80	25.22	

Table.4 Effect of seasons, hybrids and flat/ridges on Grain yield

	Kharif						Spring						
	Pio 1855	**DKC 9108**	**DOW 2244**	**Kaveri 4210**	**Rasi 4558**	**Pio 1844**	**Pio 1855**	**DKC 9108**	**DOW 2244**	**Kaveri 4210**	**Rasi 4558**	**Pio 1844**	**Mean**
Ridge(kharif)	45.6	67.15	61.42	26.93	26.05	46.97	53.06	44.97	52.44	40.26	45.24	48	47.33
Flat(kharif)	53.02	43.95	25.86	29.37	37.55	33.11	22.44	34.62	21.51	34.88	51.6	26.93	31.99
Ridge(spring)	52.04	49.51	58.84	44.57	40.75	30.57	43.6	43.91	41.73	34.44	52.44	52.84	44.82
Flat(spring)	33.46	37.42	30.53	32.48	25.73	33.64	34.17	43.15	31.95	22.13	23.73	45.73	33.48
Mean	46.03	49.51	44.16	33.34	32.51	36.07	38.32	41.66	36.91	32.93	43.25	43.37	39.41

Effect of seasons and hybrids on grain yield

	Pio 1855	DKC 9108	DOW 2244	Kaveri 4210	Rasi 4558	Pio 1844	Mean
kharif	46.03	49.51	44.16	33.34	32.51	36.07	40.27
Spring	38.32	41.66	36.91	32.93	43.25	43.37	39.41
Mean	42.17	45.58	40.53	33.13	37.88	39.72	39.84

Effect of season and sowing methods (flat/ridges) on grain yield

	Ridge(kharif)	Flat(kharif)	Ridge(spring)	Flat(spring)	Mean
Kharif	45.68	37.14	46.05	32.21	40.27
Spring	47.33	32	44.83	33.48	39.41
Mean	46.50	34.57	45.44	32.84	

Effect of hybrids and sowing on different methods (flat/ridges) on grain yield (q/ha)

	Ridge (kharif)	Flat (kharif)	Ridge (spring)	Flat (spring)	Mean
Pio 1855	49.33	37.73	47.82	33.82	42.17
DKC 9108	56.97	39.28	46.71	40.28	45.58
DOW 2244	56.93	23.68	50.28	31.24	40.53
Kaveri 4210	33.6	32.13	39.51	27.31	33.13
Rasi 4558	35.62	44.57	46.6	24.73	37.88
Pio 1844	47.48	30.02	41.71	39.68	39.72
Mean	46.50	34.57	45.44	32.84	

Effect of hybrids and sowing on different methods (flat/ridges) on grain yield (q/ha)

The comparison between hybrids and sowing on different methods (flat/ridges). DKC 9108 performed superior than all the other has been observed for grain weight in kharif season. The comparison with DKC 9108(45.58q/ha) with other hybrids performed followed by Pioneer1855 (42.17q/ha), DOW2244 (40.53q/ha), pioneer (39.72q/ha), Rasi4558 (37.38q/ha), kaveri4210 (33.13q/ha) has been observed grain weight quintal per hectare. Among Ridge/flat sowing methodology it was found that Ridge sowing is performed superior as compared to flat sowing in both seasons. During kharif season average yield at ridge sowing (46.50q/ha) and flat sowing average yield (34.57q/ha). During spring season average yield at ridge sowing (45.44q/ha) and flat sowing average yield (32.84q/ha). Across hybrids even though these were non significantly different from each other (as per ANOVA analysis).

In conclusion, ridge planting method exhibit better grain yield as well as grain contributing characters namely cob weight, number of cobs, cob length, cob height, stubble weight and harvest index in both seasons (kharif and spring). DKC 9108 performed better as compared to other hybrids in both kharif seasons whereas Pioneer 1844 was performed superior in spring season.

Kharif season shows better results as compared to spring season for performance of all hybrids. The ridge sowing methodology

was more efficient as compared to flat sowing in our findings. In ridge sowing, agronomic practices were conducted easily as compared to flat sowing. In ridge sowing, fertilizers and pesticide application was easier and reduces losses in addition to relatively better control of weeds. The irrigation management was easier and more. So DKC 9108 hybrid, sown in kharif season on ridges has been recommended on basis of our results. In DKC 9108 hybrid highest benefit cost ratio (1.70) as compared to other hybrids

References

Afzal, M. A. U. H., Ahmad, a. U. H., and zamir, s. I. (2013). Performance of multicut forage sorghum under various sowing methods and nitrogen application rates. *The journal of animal and plant sciences*, *23*(1), 232-239.

Akmal, M., Rehman, H., Farhatullah, M. A., and Akbar, H. (2010). Response of maize varieties to nitrogen application for leaf area profile, crop growth, yield and yield components. *Pak. J. Bot*, *42*(3), 1941-1947.

Ali, M. K., Alam, M. N., Barkotulla, M. A. B., Khandaker, S. M. A. T., and Simon, P. W. (2014) Effect of Earthing up and Level of Irrigation on Yield and Quality Seed Production of Onion. *Progressive Agriculture*, *18*(2), 81-91.

Amin, M. T., Anjum, L., Alazba, A. A., and Rizwan, M. (2015). Effect of the irrigation frequency and quality on yield, growth and water productivity of maize crops. *Quality Assurance and Safety of Crops and Foods*, *7*(5), 721-730.

Bakht, J., Siddique, M. F., Shafi, M., Akbar, H., Tariq, M., Khan, N., ...& Yousef, M. (2007). Effect of planting methods and nitrogen levels on the yield and yield components of maize. *Sarhad Journal of Agriculture*, *23*(3), 553.

Belay, Y. (1998). Effect of tied ridges on grain yield response of Maize (*Zea mays* L.) to application of crop residue and residual N and P oil two soil types at Alemaya, Ethiopia. *South African Journal of Plant and Soil*, *15*(4), 123-129.

Brar, H. S., Khehra, A. S., Sharma, R. K., and Dhillon, B. S. (1988). Effect of sowing dates, method of sowing and row spacing on maize varieties in winter. *Indian J Eco*, *15*(1), 62-65.

Chandrasekaran, B., Annadurai, K., and Somasundaram, E. (2010). *A textbook of agronomy*. New Age International Limited.

Ehsanullah, U., Anjum, S. A., Ehsan, F., Khan, I., and Ghaffar, A. (2015) Tillage practices and sowing methods affect yield and related attributes of maize. *Asian J. Agric. Biol*, *3*(1): 8-14.

Gul, S., Khan, M. H., Khanday, B. A. &Nabi, S. (2015). Effect of sowing methods and NPK levels on growth and yield of rainfed maize (*Zea mays* L.). *Scientific*, *2015*.

Gul, S., khan, M. H., khanday, B. A., and Nabi, S. (2015). Effect of sowing methods and npk levels on growth and yield of rainfed maize (*Zea mays* l.). *Scientifica*, *2015*.

Gwenzi, W., Taru, M., Mutema, Z., Gotosa, J., and Mushiri, S. M. (2008). Tillage system and genotype effects on rainfed maize (*Zea mays* L.) productivity in semi-arid Zimbabwe. *African Journal of Agricultural Research* *3*(2) 101-110.

Hussain, N., Jamal, M., Hassan, G., and Yaqoob, M. (1999). Effect of methods of sowing and cultural practices on maize. *Sarhad Journal of Agriculture (Pakistan)*.

Hussain, N., Jamal, M., Hassan, G., and

Yaqoob, M. (1999). Effect of methods of sowing and cultural practices on maize. *Sarhad Journal of Agriculture (Pakistan).*

Jassal, R. K. (2013). *Effect of planting methods and nitrogen levels on the seed production of fodder maize* (Doctoral dissertation, Punjab Agricultural University, Ludhiana).

Kaur, A. (2016). *Effect of different planting methods and nitrogen levels on the growth, yield and quality of kharif maize (Zea mays L.)* (Doctoral dissertation, Punjab Agricultural University, Ludhiana)

Kaur, j., and bons, h. K. (2017). Mulching: a viable option to increase productivity of field and fruit crops. *Journal of applied and natural science*, *9*(2), 974-982.

Kaur, M. (2011). *Growth, quality and water productivity of August sown maize as affected by planting method, mulch and irrigation regimes* (Doctoral dissertation, Punjab Agricultural University, Ludhiana).

Kaur, T. (2002). *Studies on irrigation requirement in relation to method of planting of maize (Zea mays L.)* (Doctoral dissertation, M. Sc. Thesis, Punjab Agricultural University, Ludhiana, India).

Kaur, T., &Mahey, R. K. (2006). Effect of Planting Methods and Irrigation Levels on Water Use of Maize (*Zea mays*, L.). *Green Technologies for Sustainable Agriculture*, 286.

Khan, M. B., Rafiq, R., Hussain, M., Farooq, M., &Jabran, K. (2012) Ridge sowing improves root system, phosphorus uptake, growth and yield of Maize (*Zea mays* L.) Hybrids. *Measurements*, *22*, 309-317.

Khehra, A. S., Dhillon, B. S., Saxena, V. K., Malhi, N. S., Kapoor, W. R., Pal, S. S., and Malhotra, V. V. (1981). Studies on winter maize in Punjab. In *Proc. Seventh Rabi Maize Workshop. All India Coordinated Maize Improvt. Proj., New Delhi, India* (pp. 72-80).

Kumar, V., Sharma, V., Sharma, S. C., and Singh, S. (2017). Performance of high yielding drought tolerant varieties of maize and in situ moisture conservation techniques in Kandi region of Punjab, India. *Journal of Applied and Natural Science*, *9*(1), 316-32.

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