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Effect of Different Date of Sowing on Growth and Yield of Maize Varieties

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Abstract

An experiment entitled "Effect of different date of sowing on growth and yield of Maize Varieties" was conducted at Research Farm of KVK Reasi, during kharif 2022. The soil of experiment site was sandy clay loam in texture with the pH-7.02, high in organic carbon, high in available nitrogen, phosphorus and potassium. The treatments consisted of three different sowing dates (10th June (D_1), 20th June (D_2) and 30th June (D_3)) and three varieties, Double Dekalb (V_1), Kanchan-612 (V_2) and PROAGRO-4794 (V_3)) were taken. The experiments were laid in a randomized complete block design with three replications and spacing of 60 x 20 cm. The crop was fertilized with 60 kg N, 40 kg P and 20 kg/ha through urea, diammonium phosphate (DAP) and muriate of potash (MOP) respectively. The data showed significant effects of different sowing time. The highest grain yield was obtained from 10th June sowing date 39.6 q ha-1 which was at par with 20th June sowing date 37.8 q ha-1. Whereas, among the different varieties, Double Dekalb recorded highest grain yield 38.4 q ha^{-1} which was followed by PROAGRO-4794.

***Key words*:** Maize, Date of sowing, Varieties, Kharif, Yield

In India, maize (*Zea mays* L) is emerging as third most important crop after rice and wheat. Its importance lies in the fact that it is not only used for human food and animal feed but at the same time it is also widely used for corn starch industry, corn oil production, baby corns etc. Maize is grown throughout the year in India. Maize is the third most important cereal crop in India after rice and wheat. It accounts for 9 per cent of total food grain production in the country. The year-to-year variation in plant establishment, pest and disease incidence makes it difficult to predict optimum planting dates for maize crop. For optimization of yield, planting at the appropriate time is very critical as delay in planting date can lead to a linear decrease in grain yields [1]. Despite of all these differences in sowing period, many scientists and farmers opined that early and mid-early sowings in India resulted good yields and high-quality seed. The literature available on effect of sowing date on maize was reviewed and described as under by using various headings.

Optimizing of sowing date depend on the maturity stage is among the most important agronomic practices to increase crop production. High yielding varieties of maize are most sensitive to time of sowing; hence optimum time of sowing contributes more towards maize grain yield [2-3]. It is therefore necessary to determine suitable planting time at different location to enhance productivity and production of maize in Reasi district.

MATERIALS AND METHODS

A field study was conducted at Research Farm of Krishi Vigyan Kendra Reasi, during kharif 2022 cropping season to determine the effect of different sowing dates and varieties on plant height, dry matter, number of ear heads m^{-2}, length of spike, weight of spike, 1000-grain weight, grain yield and straw yield. Three different sowing dates (10th June (D_1), 20th June (D_2) and 30th June (D_3)) and three varieties, Double Dekalb (V_1), Kanchan-612 (V_2) and PROAGRO-4794 (V_3)) were taken. The experiments were laid in a randomized complete block design with three replications and spacing of 60x20 cm. The crop was fertilized with 60 kg N, 40 kg P and 20 kg/ha through urea, diammonium phosphate (DAP) and muriate of potash (MOP) respectively. The soil of the experimental plot was sandy clay loam, having high in nitrogen, phosphorous and potassium and organic carbon.

RESULTS AND DISCUSSION

Phenological studies

The maize sown under different date of sowing took the number of days to attained a particular phenophases were worked out and mentioned in (Table 1). The result revealed that first date of sowing crop matures in 105 to 107 days, while second and last date of sowing took 99 to 101 and 93 to 95 days, respectively. The maximum days required for tassel emergence after 6th leaf followed by silking to dough stage. Similarly, Sulochana *et al.* [4] observed that date of sowing brought immense impact and significant variation in number of days required to attain emergence, fifth leaf, knee high and maturity stage. The phonological studies revealed that a smaller number of days needed for initiation and completion of the reproductive phenophases in case of late sowing than early sown crops.

Yield attribute

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Table 1 Effect of date of sowing on phenology stages and growth of three maize cultivars grown during *kharif*-2022

Treatments	Sowing	Emergence	6th leaf	Tassel	Silking	Dough	P. Maturity	Total
D_1V_1	10-06-2022 (6)	15-06-2022 (10)	24-06-2022 (38)	31-07-2022 (5)	04-08-2022 (32)	04-09-2022 (16)	19-09-2022	107
D_1V_2	10-06-2022 (6)	15-06-2022 (11)	25-06-2022 (37)	31-07-2022 (5)	04-08-2022 (30)	02-08-2022 (16)	17-09-2022	105
D_1V_3	10-06-2022 (7)	16-06-2022 (10)	25-06-2022 (38)	01-08-2022 (6)	06-07-2022 (31)	05-08-2022 (14)	18-09-2022	106
D_2V_1	20-06-2022 (6)	25-06-2022 (10)	04-07-2022 (35)	07-08-2022 (5)	11-08-2022 (30)	09-09-2022 (15)	23-09-2022	101
D_2V_2	20-06-2022 (6)	25-06-2022 (9)	03-07-2022 (34)	05-08-2022 (5)	09-08-2022 (31)	08-09-2022 (14)	21-09-2022	99
D_2V_3	20-06-2022 (6)	25-06-2022 (10)	04-07-2022 (34)	06-08-2022 (4)	09-08-2022 (31)	08-09-2022 (15)	22-09-2022	100
D_3V_1	30-06-2022 (6)	05-07-2022 (9)	13-07-2022 (32)	13-08-2022 (5)	17-08-2022 (29)	14-09-2022 (14)	27-09-2022	95
D_3V_2	30-06-2022 (6)	05-07-2022 (8)	12-07-2022 (30)	10-08-2022 (5)	14-08-2022 (30)	12-09-2022 (14)	25-09-2022	93
D_3V_3	30-06-2022 (7)	06-07-2022 (9)	14-07-2022 (31)	13-08-2022 (4)	16-08-2022 (30)	14-09-2022 (13)	26-09-2022	94

Statistically significant variation in yield attributes like cob length, cob weight without sheath, number of grains / cob, grains weight / cob and test weight (gm) were observed under different dates of sowing is presented in (Table 2). Among the different date of sowing highest cob length (20.3), cob weight without sheath (90.2), number of grains/cob (433.5), grains weight/cob (53.0) and test weight (228.2 gm) were observed under 10th June sowing (D_1) which was at par with 20th June sown (D_2) maize crop and lowest was recorded under 30th June sowing (D_3). Although the acceleration in the rate of crop development associated with increased plant density or with delay in planting date means that the duration of the phase of spikelet initiation is reduced, the overall effects of these two management factors upon cob size are different. Tsimba *et al.* [5]. While, among the different varieties there was non-significant variation with respect to cob length, cob weight without sheath, number of grains/cob, grains weight/cob and test weight (gm).

Table 2 Effect of date of sowing on cob length, cob weight without sheath, number of grains/cob, grains weight/cob and test weight (gm) of three maize cultivars grown during *kharif* 2022

Treatments	Cob length	Cob weight without sheath	Number of grains / cob	Grains weight / cob	Test weight (gm)
D_1 (10.06.2022)	20.3	90.2	433.5	53.0	228.2
D_2 (20.06.2022)	19.5	78.9	421.3	46.5	223.3
D_3 (30.06.2022)	14.8	64.8	350.8	30.0	200.4
Sem±	1.18	5.09	17.07	2.32	6.03
CD at 5%	3.54	15.26	53.11	6.94	18.1
		Varieties			
V_1 (Double Dekalb)	19.1	81.3	423.2	46.5	220.0
V_2 (Kanchan-612)	16.9	75.3	401.1	40.5	216.5
V_3 (PROAGRO-4794)	18.6	77.9	411.3	42.4	215.5
Sem±		5.06	17.13	2.34	6.15
CD at 5%	NS	NS	NS	NS	NS

Plant growth

Plant height and dry matter at 30 and 60 DAS was significantly varied among different dates of sowing is presented in (Table 3). Highest plant height and dry matter at 30 and 60 DAS was recorded (52.89 and 191.21) under first date of sowing (D_1) which was significantly at par with second date of sowing (D_2) (50.73 and 189.42) and minimum plant height was recorded under third date of sowing (D_3). The different varieties of maize didn't show any significant differences being non-significant the maximum plant height and dry matter was produced by variety V_1 (Double Dekalb) and minimum height was produced by V_2 (Kanchan-612). Azadbakht *et al.* [6] observed that the highest plant height by average of 238.3 cm as compared to the first planting date (29th April) and by postponing the planting date the height reduced as the lowest plant height (213.32 cm) related to fourth planting date (4th June).

Grain yield

The variation in grain yield with respect to different treatments were compiled and presented in (Table 3). Significant variation was observed in maize yield with respect to different dates of sowing. Among the three date of sowing, highest grain yield (39.67 q ha^{-1}) was recorded under 10th June sown (D_1) which was at par with 20th June sown (D_2) maize crop, whereas the lowest yield (32.74 q ha^{-1}) was obtained under 30th June sowing (D_3). While among different varieties of grain yield of maize crop no significant difference. The variety

'Double Dekalb' (V_1) was recorded highest grain yield followed by 'PROAGRO-4794' (V_3) and Kanchan-612 (Table 3). Late sowing of maize in the season has compressed the reproductive stage of development, resulting in a significant reduction in the very late sowing date, which has harmed grain development and resulted in a lower grain index, resulting in a loss of grain yield [7-9]. Delay in planting date determined important reductions in the amount of incident radiation accumulated from emergence to silking, because it hastened development. Low temperatures during grain filling in late plantings limited seed growth as well as crop photosynthesis. Thus, the ratio between final seed number and dry matter at silking dropped dramatically for the late plantings, indicating a predominance of vegetative growth over reproductive growth. The delay in planting, can significantly impact grain yield. Late plantings showed a predominance of vegetative growth over reproductive growth, leading to a drop in the ratio between final seed number and dry matter at silking.

Stover

The stover yield was significantly difference with respect to different date of sowing and no significant among different varieties is presented in (Table 3). Among the three date of sowing, highest stover yield (90.25 q ha^{-1}) was recorded under 10th June sown (D_1) which was at par with 20th June sown (86.30) (D_2) maize crop, whereas the lowest stover yield (72.94 q ha^{-1}) was obtained under 30th June sowing (D_3). Whereas, among the different varieties of maize crop didn't show any significant variation. The date of sowing seems to have a notable impact on stover yield, with the earliest sowing date (10th June) resulting in the highest yield, followed by the second sowing date (20th June), and the latest sowing date (30th June) resulting in the lowest yield. However, the varieties of maize crop did not show a significant difference in stover yield in the provided information. Singh *et al.* [10] also obtained lower grain yield with delay in sowing due to shorter duration of growth and development.

Table 3 Effect of date of sowing on grain yield (q ha^{-1}), stover yield (q ha^{-1}) and plant height (cm) of three maize cultivars grown during *kharif*, 2022

Treatments	Plant height (cm)		Dry matter (g)		Grain yield (q ha^{-1})	Stover yield (q ha^{-1})
	30 DAS	60 DAS	30 DAS	60 DAS		
D_1 (10.06.2022)	52.89	191.21	4.94	52.01	39.67	90.25
D_2 (20.06.2022)	50.73	189.42	5.87	51.34	37.88	86.30
D_3 (30.06.2022)	47.58	173.20	3.23	48.21	32.74	72.94
Sem±	0.49	3.37	0.48	0.82	1.51	4.02
CD at 5%	1.48	10.08	1,43	2.43	4.46	12.01
			Varieties			
V_1 (Double Dekalb)	50.81	184.94	5.01	51.73	38.42	85.67
V_2 (Kanchan-612)	50.13	183.10	4.24	48.91	34.96	80.13
V_3 (PROAGRO-4794)	50.26	184.92	4.79	50.92	36.91	83.69
Sem±	0.45	3.33	0.44	0.79	1.49	3.98
CD at 5%	N.S	N.S	N.S	N.S	N.S	N.S

CONCLUSION

In total, early or mid-early sowings can be recommended for the hybrid seed production of maize, because plants have longer growth period, their growth and development of plant coincides with favorable environmental conditions, thus produce vegetative development and reproductive parts and more assimilates.

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