Indian Journal of Agronomy 44 (3) : 560–563 (September 1999)

Effect of sowing dates on winter maize (*Zea mays*) varieties in command area of southern Rajasthan

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Received: November 1997

ABSTRACT

A 3 years field study (1994-97) revealed that winter maize sown in first fortnight of November gave maximum grain yield of 48.2 q/ha with maximum net return of Rs 22,109/ha. Early and delayed sowings to mid-November reduced the grain yield by 3.9 to 66.4% and net return by Rs 3,059-16,387/ha. Least grain yield (16.2 q/ha) and net return (Rs 4,730/ha) were realised when maize was sown on 25 December. Full season composite 'Mahi Dhawal' yielded 11.9% higher over early composite 'Mahi Kanchan' (32.7 q/ha), thus latter was better choice in late sown conditions at tail end of canal.

Key words: Winter maize, Sowing date, Yield

Winter maize sowing gets delayed some times due to late harvest of preceding crop or late opening of canal in the command area of southern Rajasthan. Delayed sowing particularly in December results in delayed emergence due to low temperature with poor yields. Similarly, very early sowings are not conducive to the maize growth and yields. Therefore, an attempt was made to find out optimum time of sowing with suitable variety for winter maize in the command area of southern Rajasthan.

MATERIALS AND METHODS

An experiment was conducted during winters of 1994-97 at Agricultural Research Station, Banswara. The soil of experimental site was clay loam in texture having pH 8.5 low in organic carbon (0.45%) and N (115.7 kg/ha) and medium in P and K (36.0 and 280 kg/ha). Sixteen treatments comprised 8 dates of sowing, i.e. 15, 25 October, 5, 15, 25 November, 5, 15, 25 December in main plots and 2 varieties, i.e. early maturing composite, 'Mahi Kanchan', and full season composite, 'Mahi Dhawal', in subplots were tried in a split-plot design with 4 replications. Maize was sown at crop geometry of 60 cm x 20 cm. A uniform dose of 50 kg N and 40 kg P_2O_5/ha was applied at sowing and remainder 100 kg N/ha in 2 equal splits was top-dressed at knee high and pretasseling stages. As sufficient amount of potash was available in soil, additional quantity of K was

Table 1. Effect of sowing dates and varieties on yields, harvest index and relative economics of winter maize (pooled data of 3 years)

Treatment	Temperature at sowing (°C)	Emergence period (DAS)	Pooled (1994-97)			Return (Rs/ha)		Net return (Rs/ha) over	
			Grain yield	Stover yield	Harvest index	Gross	Net	Mid-October	After mid-November
Sowing date									
15 October	26.6 ± 1.4	4-5	40.1	100.1	28.6	23,053	17,753		-3,364
25 October	26.4 ± 1.6	4-5	38.9	97.9	28.5	22,387	17,087	- 666	-4,030
5 November	23.9 ± 0.7	4-6	48.2	110.3	30.5	27,409	22,109	+4,536	+ 992
15 November	23.4 ± 1.1	5-6	46.3	108.9	29.8	26,417	21,117	+3,364	
25 November	21.5 ± 1.0	6.8	40.8	98.6	29.2	23,358	18,058	+305	-3,059
5 December	19.9 ± 1.4	8-10	28.5	77.4	27.3	16,572	11,278	-6,481	-9,845
15 December	18.8 ± 0.5	10.12	18.5	66.1	22.5	11,253	6,033	-11,720	-15,084
25 December	18.7 ± 2.4	10.12	16.2	61.0	22.4	9,930	4,730	-13,023	-16,387
CD (P = 0.05)			3.57	12.18					
Variety									
'Mahi Kanchan'			32.7	87.9	27.2				
'Mahi Dhawal'			36.6	92.2	28.4				
CD (P = 0.05)			N.S.	N.S.					

Selling price (Rs/q) of maize grain 500 and stover 50

not applied. Fluctuation in temperature during the crop season is depicted in Table 1. The crop received 6 irrigations and was harvested in March-April. The grain and the stover yields were recorded, and harvest index, relative economics and correlations were studied for treatment evaluation.

RESULTS AND DISCUSSION

Effect of sowing time on yields

Pooled data of 3 years of experimentation indicated that maximum grain (48.2 q/ha) and stover (110.3 q/ha) yields with harvest index of 30.5 was recorded when maize was sown on 5 November at 23.9±0.7°C atmospheric temperature which was closely followed by 15 November sowing at 23.4 ±1.1°C with the grain and the stover yields of 46.3 q/ha and 108.9 q/ha respectively (Table 1). Early and delayed sowings to first fortnight of November recorded significantly low grain (16.2-40.1) and stover (61.0-98.6 q/ha) yields and harvest index (22.4-29.2). December sowings affected the grain and stover yields drastically by 29.3-58.8% and 21.5-38.0%, respectively over 25 November sowings because of low temperature at sowing prolonged the period of emergence which in turn allowed less period for silking, seed formation and filling. Hot weather in March (40°C) may also prevent the late sown maize from maturing viable seed and the grains remain smaller in size because of high rate of respiration and reduced accumulation of photosynthates. These results are in close confirmity to the findings of Sawhney *et al.* (1989), Khandale and Relwani (1991) and Tyagi *et al.* (1994). Khandale and Relwani (1991) have clearly reported that winter maize yields declined significantly with each successive delay in sowings because environmental factors like temperature, solar radiation and day light gradually diminished during October to December and favoured the growth of early sown crop than that of late sown.

Table 2. Interaction effect of sowing dates and varieties on the grain and the stover yields of maize (1996-97)

Variety	Sowing date							
	15 Oct.	25 Oct.	5 Nov.	15 Nov.	25 Nov.	5 Dec.	15 Dec.	25 Dec.
	Grain yield (q/ha)							
'Mahi Kanchan'	39.0	35.3	45.5	42.9	37.5	26.0	16.8	18.2
'Mahi Dhawal'	46.2	40.0	54.7	49.2	41.7	30.0	16.3	14.3
	Stover yield (q/ha)							
'Mahi Kanchan'	96.7	83.0	106.2	97.3	96.7	52.2	61.7	63.0
'Mahi Dhawal'	116.3	97.0	117.7	115.0	99.8	79.0	48.3	44.3

CD (P = 0.05)	*Date of sowing*	*Variety*	*Date of sowing × variety*
Grain	2.37	1.19	3.36
Stover	7.91	3.95	11.18

Varietal performance

Full season composite 'Mahi Dhawal' yielded higher grains by 11.9% over early composite 'Mahi Kanchan' (32.7 q/ha) though the differences were not statistically different, whereas this increase in stover yield and harvest index was narrowed to 4.9% and 4.4% respectively (Table 1).

There was no significant interaction of date of sowings and varieties based on 3 years pooled yields. However, an interaction of date of sowings and varieties was found significant in 1996-97, irrespective of variety. Maize sown on 5 November gave significantly higher grain yield up to mid-December sowings. Full season, 'Mahi Dhawal' gave significantly higher grain yields up to 5 December sowing and thereafter it declined at faster rate (45.7-52.3%) than that of early composite 'Mahi Kanchan' i.e. 30.0-35.4%, Table 2). It revealed that 'Mahi Kanchan' may be a better choice in late sown conditions of December, particularly on tail ends of the canal.

Effect of sowing dates on relative economics

Sowing time affected the grain and the stover yields and harvest index on account of varied temperature pattern at sowing and other stages. Correspondingly, the yields also affected relative economics of winter maize cultivation. Per hectare net return over mid-October sowings was maximum when maize was sown in first fortnight of November (Rs 3,364 to 4,356). Maize sown on 25 October tended to record a loss of Rs 666, which was widened correspondingly when sowings were delayed up to December (Rs 6,481 to 13,023). When net return was compared over mid- November sowings, crop sown on 5 November yielded Rs 992 higher but early or late sowings reduced the net return and caused a loss of Rs 3,059 to 16,387 (Table 1).

Table 3. Correlation between temperature at sowing time and the yields harvest index and grain yield and net return

Correlation	r value
Temperature and the grain yield	+0.78
Temperature and the stover yield	+0.71
Temperature and harvest index	+0.73
Grain yield and net return	+0.999

Correlations

There was strong positive correlation between temperature at sowing and the grain yield, stover yield and the harvest index : the grain yield and net return (Table 3).

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