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Response of Durum Wheat (*Triticum durum* Desf.) to Sowing Dates and N-Levels in Vertisol of Central India

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ABSTRACT

A field experiment was conducted during the winter seasons (*Rabi*) 1994-95 and 1995-96 in Vertisol at Powarkheda (M.P.) to find out optimum sowing time and N-level for the durum type wheat. The results that durum wheat (cv. HI 8381) sown on 17 November provided the highest mean grain yield (2912 kg/ha), straw yield (3894 kg/ha) and economic benefits (Rs. 6753/ha net return and 2.16 B : C ratio) over early (2 November) and delayed sowing (2 December). Among the N-levels (0, 30, 60, 90 and 120 kg/ha), maximum mean values for grain yield (3890 kg/ha), straw yield (4792 kg/ha), net return (Rs. 9762/ha) and C : B ratio (2.67) were found with 120 kg N/ha. The interaction effects of sowing dates and N-levels on grain and straw yield were not significant.

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INTRODUCTION

The global trade of agricultural produces are expected to be changed in near future and there are good prospects to export durum type wheat (*Triticum durum* Desf.) from Central India. The unique climatic conditions of Central India favoured the production of excellent quality durum wheat having Karnal bunt free, bold and lusterious grains with high protein content and minimum yellow berry occurrance.

The experiment has been conducted with a view to find out optimum sowing time and N-level for production of durum wheat in Vertisol under irrigated conditions.

MATERIALS AND METHODS

A field experiment was conducted during winter seasons 1994-95 and 1995-96 at JNKVV, Zonal Agricultural Research Station, Powarkheda involving durum wheat variety HI 8381 (Malawa shree) consisting of 3-dates of sowing (2 Nov., 17 Nov. and 2 Dec.) in main plots and 5 N-levels (0, 30, 60, 90 and 120 kg/ha) in sub plots, in split plot design. The treatments were replicated 4-times. The soil of the experimental site was clayey in texture (deep Vertisol), netural in reaction (pH 7.6), low available nitrogen (180 kg/ha), medium in available phosphorus (18 kg/ha) and high in available potassium (400 kg/ha). The crop was sown in 20 cm apart using 125 kg seed/ha. Half dose of N (as per treatment) alongwith a

common dose of 30 kg P_2O_5 and 20 kg K_2O/ ha was given at the time of sowing and remaining N was broadcasted at first irrigation. During the crop seasons about 56.09 mm and 74.6 mm rains were recorded in 1994-95 and 1995-96 respectively (Table 1). The crop received 4 irrigations during both the years. Economics was calculated on the basis of prevailing market rates of field operation, inputs and produce.

RESULTS AND DISCUSSION

Date of Sowing

The higher yield of grain and straw during 1994-95 than that during 1995-96 in all treatments were mainly owing to lower temperature experienced through out the season during the former year (Table 1). The November sown (2 Nov. and 17 Nov.) durum wheat produced high grain yield as compaed to crop sown on 2 Dec. However, the differences were significant in first year and in pooled analysis. The pooled data of 2 years (Table 2) revealed that irrigated durum wheat performed the best with regard yield characteristics, grain yield and straw yield when sown on 17 November. The deviation in planting time after 17 November led to significant decline in the grain productivity (12.4%) and yield attributing characteristics length, weight and grains per earhead and 1000-grain weight. The grain yield also reduced (1.7%) in earlier sowing, however, the difference was not significant. The probable reason of low grain yield in delayed sown (2 Dec.) crop is shortening of total life span of the crop. The late sown crop when attains flowering stage, the atmospheric temperature starts rising. Therefore the crop is forced to flower and mature early. Saini *et al.* (1986 a) also have same views. The correlation between mean temperature at sowing and grain yield was computed with data of both seasons and it was found significant ($r = 0.64^{**}$) .

TABLE 1

Temperature and rainfall data during experimentation.

Period	Temperature °C						Rainfall, mm	
	1994-95			1995-96			1994-95	1995-96
	Maxi.	Min.	Av.	Maxi.	Min.	Av.		
25 Oct. — 9 Nov.	30.6	16.2	23.4	30.9	15.2	23.1	2.8	—
10 Nov. — 24 Nov.	28.9	14.5	21.7	29.5	13.3	21.4	—	—
25 Nov. — 9 Dec.	28.1	11.9	20.0	27.5	12.3	19.9	—	—
10 Dec. — 24 Dec.	25.2	9.6	17.4	28.2	12.8	20.5	—	—
25 Dec. — 9 Jan.	24.3	11.0	17.7	22.3	15.5	18.9	26.4	14.8
10 Jan. — 24 Jan.	21.1	9.2	15.2	25.8	12.6	19.2	7.0	11.4
25 Jan. — 9 Feb.	25.6	10.7	18.2	27.5	11.6	19.6	—	50.6
10 Feb. — 24 Feb.	28.6	12.1	20.4	27.6	12.9	20.3	—	—
25 Feb. — 9 Mar.	28.4	13.5	21.0	30.1	15.6	22.9	3.7	—
10 Mar. — 24 Mar.	30.9	18.1	24.5	35.5	17.2	26.4	19.9	—
25 Mar. — 9 Apr.	35.7	18.2	27.0	37.1	18.8	27.6	—	—
10 Apr. — 25 Apr.	37.5	20.3	28.9	40.8	27.1	34.0	6.0	—

TABLE 2

Yield attributing characters of durum wheat as influenced by sowing time and nitrogen levels.

(Pooled data of 2-years)

Treatments	*Earhead/ m², no.*	*Earhead-length, cm.*	*Spikelets/ earhead, no.*	*Weight earhead, g.*	*Grains/ earhead, no.*	*1000-grain weight, g.*
Dates of sowing						
2 November	222.0	5.23	13.5	2.59	34.9	51.3
17 November	213.8	5.65	14.3	2.89	36.4	51.7
2 December	200.7	5.30	13.9	2.37	33.1	48.5
CD (P = 0.05)	19.9	0.27	0.8	0.28	2.7	1.4
N-levels, kg/ha						
0	176.3	4.75	12.8	2.11	27.2	48.4
30	192.6	5.28	13.8	2.56	34.2	49.7
60	216.4	5.33	14.2	2.76	37.8	50.6
90	231.5	5.64	14.3	2.76	37.2	51.6
120	253.3	5.75	14.5	2.88	37.5	52.3
CD (P = 0.05)	20.0	0.16	0.8	0.15	2.1	1.8

TABLE 3

Yield and economics of durum wheat as affected by sowing time and nitrogen levels.

Treatments	*Grain yield, kg/ha*			*Straw yield, kg/ha*			*Economics (Pooled)*	
	94-95	*95-96*	*Pooled*	*94-95*	*95-96*	*Pooled*	*Net return, Rs/ha*	*B : C Ratio*
Dates of Sowing								
2 November	3290	2411	2851	3621	3328	3475	6223	2.06
17 November	3310	2537	2924	4073	3715	3894	6753	2.16
2 December	2750	2346	2550	4171	3367	3769	5249	2.00
CD (P = 0.05)	252	NS	217	291	NS	246	—	—
N-levels kg/ha								
0	1638	1082	1360	2497	1855	2176	1130	1.25
30	2689	1757	2223	3503	2811	3157	4148	1.89
60	3278	2419	2849	4083	3689	3886	6772	2.13
90	3839	3262	3551	4707	4396	4552	8663	2.44
120	4142	3638	3890	4984	4599	4792	9672	2.67
CD (P = 0.05)	333	236	184	446	276	258	--	--

Pooled results on net return revealed that maximum net return of Rs. 6753/ha and B : C ratio of 2.16 were noted with 17 Nov. sown crop (Table 3).

Levels of nitrogen

Increasing levels of N increased the growth and yield attributes (Table 2) Grains/ earhead, weight/earhead and 1000-grain

weight were statistically at par beyond 60 kg N/ha. The differences were also not significant between 90 and 120 kg N/ha for effective earheads/m^2 and length of earhead. Application of N, however, did not influence the spikelets/earhead. Each additional N-increment of 30 kg/ha increased the yield significantly upto 120 kg/ha for grain and upto 90 kg/ha for straw. On pooled basis 120 kg N/ha gave 3890 kg grain yield/ha which was higher by 339, 1041, 1667 and 2530 kg/ha over 90, 60, 30 and 0 N-application respectively. The improvement in yield on application of N might be due to improvement in growth and yield attributing characters and higher photosynthetic activities. The findings is accordance with that reported by Patel *et al.* (1995) in aestivum wheat. The maximum net return (Rs. 9672/ha) and B : C ratio (2.67) was also recorded with 120 kg N/ha and minimum in without N application (Rs. 1130/ ha, B : C ratio 1.25).

It was concluded that irrigated durum wheat should be planted during middle of November and applied 120 kg N/ha for getting maximum grain yield and economic benefit in Vertisol of Central India.

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