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Yield and yield component response of wheat (*Triticum aestivum* L) genotypes to different sowing dates in Gird region of Madhya Pradesh

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ABSTRACT

The effects of various sowing dates on yield and yield components of wheat (*Triticum aestivum* L) were studied. The experiment was conducted at agricultural research farm of College of Agriculture, Gwalior, MP during the year 2009-10 and 2010-11. The experiment comprised of four wheat genotypes (HI 8498, HI 1544, GW 322 and Lok 1) and four sowing dates. The pooled data revealed that crop sown on 14 November showed promising results in terms of grain yield (47.33 q/ha), plant height, number of ear heads per m^2, length of ear head, number of grains per ear head, weight of ear head, test weight and straw yield followed by sowing dates of 21, 28 November and 8 December. The early sowing (14 November) gave 12.80 per cent higher grain yield in comparison to that of 21 November date of sowing. The delayed sowing (8 December) reduced the grain yield (38.19 q/ha) which was 19.30 per cent lower than that of 14 November date of sowing. All the varieties sown on 14 November registered more total income, net income and B:C ratio than the crop sown on 21 November.

Key words: Wheat (*Triticum aestivum*); genotypes; sowing time; yield; returns

INTRODUCTION

Wheat is the most important food grain crop in India occupying approximately 230 million ha world over. Today India is the second largest producer of wheat with an area of 28.46 million hectare with an annual production of 80.80 million tons and the average productivity of 2,839 kg/ha (Anon 2011) which is very low as compared to yield potentials of the approved varieties in the country. Among the various factors responsible for low yield of wheat crop in the country varietal selection and sowing time are of primary importance. Its cultivation in India has been dominated by the northern region of India. The northern states of Punjab and Haryana plains in India have been prolific wheat producers. While in northern states it is grown as irrigated crop in parts of Madhya Pradesh and Maharashtra it is grown largely under rainfed conditions with little or no irrigation support. Wheat is sown in winter

and it has its own definite requirements for temperature and light for germination, growth and flowering (Dabre et al 1993). The delayed sown wheat is drastically affected not only in terms of germination but also crop growth behavior, leaf area development, number of tillers, number of grains per spike, 1,000 grain weight and test weight and eventually the grain yield. The high temperature at grain filling stage may be one of the yield reducing abiotic stresses in declining yield. High temperature in the post-entheses period of late sown wheat shortens the grain filling period resulting in a smaller endosperm, lower grain weight and increased protein content. High temperature and desiccating winds during the month of April may cause forced maturity of late sown wheat thus resulting in reduction of test weight (Singh and Dhaliwal 2000). Many high yielding varieties have been evolved and recommended for general cultivation in the past. These varieties are losing their yield potential due to change of various edaphic and environmental conditions. Therefore continuous selection of high yielding genotypes with mid range of adaptability to edaphic and environmental conditions is very essential to increase yield per hectare. Keeping this in view the present study was designed to determinate the effect of different sowing dates on growth and yield of wheat varieties in Gird region of Madhya Pradesh.

MATERIAL and METHODS

The experiment was conducted at agricultural research farm of College of Agriculture, Gwalior, MP during the year 2009-10 and 2010-11 in Rabi season. The soil of the experimental site was sandy clay loam in texture with pH 8.15 and electrical conductivity of 0.2 (ds/m). The experiment comprised of four wheat varieties (HI 8498, HI 1544, GW 322 and Lok 1) and four sowing dates viz 14, 21, 28 November and 8 December and was laid out in split plot design having three replications and a net plot size 1.4m x 7.0 m. A common fertilizer dose of 120, 60 and 40 kg of N, P and K respectively was applied during both the years. Full P and K and half N were applied as basal doses and remaining N was applied in two equal parts as top dressing at milk first immigration and second immigration stages. The crop was sown with single row hard drill on a well prepared seed bed using a seed rate of 120 kg/ha. All other agronomic practices were kept normal and uniform for all the treatments. The observations recorded included plant height (cm), number of tillers/culm, number of ear heads/m^2, length of ear head (cm), number of grains/ear head, weight of ear head (gm), test weight (g), grain yield q/ha and straw yield q/ha. The data collected were analyzed statistically separately as per the procedure given by Panse and Sukhatme (1967).

RESULTS and DISCUSSION

Effect of sowing dates

Sowing dates significantly affected the yield and yield components (Table 1). Wheat crop sown on 14 November recorded significantly higher yield and yield attributes over rest of the sowing dates. Planting of wheat crop on 14 November showed promising results in terms of grain yield (47.33 q/ha), plant height (94.15 cm), number of ear heads per m^2 (85.88), length of ear head (11.11 cm), number of grains per ear head (48.62), weight of ear head (8.04 g), test weight (38.34 g) and straw yield (64.33 q/ha) followed by sowing date of 21, 28 November and 8 December. It shows that early sowing (14 November) gave 12.80 per cent higher grain yield in comparison to that of 21 November date of sowing. The delayed sowing (8 December) reduced the grain yield (38.19 q/ha) which was 19.30 per cent lower than that of 14 November date of sowing. The lower yield in late sown wheat may be attributed to the reduction in number of grains per ear head and test weight. These results are in line with those of Rashid et al (2004), Qamar et al (2004), Subhan et al (2004), Kumar and Sharma (2003) and Singh and Dhaliwal (2000).

Effect of varieties

Significant variation in yield attributes, grain and straw yield were observed due to varietal differences (Table 1). Out of four verities HI 1544 gave the maximum and Lok 1 gave the lowest grain yield. The higher grain yield in HI 1544 was attained due to more number of tillers/ m^2, ear heads/m^2, number of grains/ear head and higher test weight as compared to HI 8498, GW 322 and Lok 1. More number of tillers, ear heads, grains/ear head and higher test weight might have contributed to higher leaf area which could be responsible for more photosynthesis.

Monetary returns from treatments

The data given in Table 2 reveal that all the varieties sown on 14 November (D_1) registered higher total income, net income and B:C ratio than the crop sown on 21 November (D_2). The treatment combination D_1V_2 gave highest net income (₹ 55,847.00 per ha) and B:C ratio (3.80) followed by D_1V_1 (₹ 54,877.50 per ha and 3.61) and D_1V_3 (₹ 52,972.50 kg/ha and 3.61). The treatment combination D_4V_4 gave lowest net income and B:C ratio ₹ 45,566.50 kg/ ha and 3.10).

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Table 1. Effect of varieties and dates of sowing on yield, yield attributes and protein content of wheat

Treatment	Plant height (cm)	Number of tillers/ culm	Number of ear heads/ m^2	Length of ear head (cm)	Number of grains/ ear head	Weight of ear head (g)	Test weight (g)	Grain yield (q/ha)	Straw yield (q/ha)
Date of sowing									
14 Nov (D1)	94.15	9.95	85.88	11.11	48.62	8.04	38.34	47.33	64.33
21 Nov (D2)	93.37	9.82	84.36	11.03	48.23	7.89	33.46	41.97	60.27
28 Nov (D3)	86.63	8.76	82.13	10.01	36.70	7.45	32.86	40.07	58.10
8 Dec (D4)	85.93	8.83	81.13	9.94	34.66	7.14	30.83	38.19	52.92
$CD_{0.05}$	4.17	1.40	1.77	0.46	1.43	0.66	3.80	4.15	5.25
Variety									
HI 8498 (V1)	89.94	9.49	82.96	10.65	43.86	7.68	37.07	42.98	58.65
HI 1544 (V2)	91.78	9.91	85.39	11.05	39.87	7.77	33.17	44.91	57.18
GW 322 (V3)	90.80	9.25	84.37	10.61	43.47	6.99	31.74	39.49	60.21
LOK 1 (V4)	89.95	9.68	83.48	10.59	39.22	7.26	35.04	39.37	56.81
$CD_{0.05}$	4.56	1.59	1.60	0.77	1.14	1.04	3.97	4.31	2.53

Table 2. Monetary returns from wheat using different dates of sowing and varieties

Treatment	Total cost of cultivation	Grain yield (q/ha)	Straw yield (q/ha)	Value		Gross income (₹ /ha)	Net income (₹/ha)	B:C ratio
				Grain (₹)	Straw (₹)			
D1V1	14,687	45.16	61.49	54,192.00	15,372.50	69,564.50	54,877.50	3.74
D1V2	14,687	46.12	60.76	55,344.00	15,190.00	70,534.00	55,847.00	3.80
D1V3	14,687	43.41	62.27	52,092.00	15,567.50	67,659.50	52,972.50	3.61
D1V4	14,687	42.35	60.57	50,820.00	15,142.50	65,962.50	51,275.50	3.49
D2V1	14,687	42.48	59.46	50,976.00	14,865.00	65,841.00	51,154.00	3.48
D2V2	14,687	43.44	58.73	52,128.00	14,682.50	66,810.50	52,123.50	3.55
D2V3	14,687	40.73	60.24	48,876.00	15,060.00	63,936.00	49,249.00	3.35
D2V4	14,687	40.67	58.54	48,804.00	14,635.00	63,439.00	48,752.00	3.32
D3V1	14,687	41.53	58.38	49,836.00	14,595.00	64,431.00	49,744.00	3.39
D3V2	14,687	42.49	57.64	50,988.00	14,410.00	65,398.00	50,711.00	3.45
D3V3	14,687	39.78	59.16	47,736.00	14,790.00	62,526.00	47,839.00	3.26
D3V4	14,687	39.77	57.46	47,724.00	14,365.00	62,089.00	47,402.00	3.23
D4V1	14,687	40.59	55.79	48,708.00	13,947.50	62,655.50	47,968.50	3.27
D4V2	14,687	41.55	55.05	49,860.00	13,762.50	63,622.50	48,935.50	3.33
D4V3	14,687	38.84	56.57	46,608.00	14,142.50	60,750.50	46,063.50	3.14
D4V4	14,687	38.78	54.87	46,536.00	13,717.50	60,253.50	45,566.50	3.10

Note: Grain price @ 1,200 /q and straw price @ 250 /q

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