

Response of wheat (*Triticum aestivum*) genotypes to planting method and manual weeding

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ABSTRACT

A field study made during the winter (*rabi*) seasons of 1986-87 and 1987-88 at Akola showed that the 'NI 5439' bread wheat (*Triticum aestivum* L. emend. Fiori & Paol.) yielded significantly higher (10.13%) than 'HD 2189'. Weeding twice was more effective than weeding once, resulting in increased grain yield up to 13.61%. The cross-sowing at 22.5 cm gave significantly higher yield attributes, grain and straw yields than other methods of sowing. Closer row spacing and cross-sowing as well as the variety 'NI 5439' showed an appreciable smothering effect on the weeds associated with the crop and recorded lower weed-dry matter. A response of larger magnitude in terms of grain yield was observed in 'HD 2189' with increase in the level of manual weeding compared with variety 'NI 5439'.

Uniform and optimum distribution of plants per unit area is one of the factors responsible for increasing wheat (*Triticum aestivum* L. emend. Fiori & Paol.) yield. Recent work suggests the achievement of this objective by manipulating the sowing method. Cross-sowing (bi-directional) shows superiority to normal (uni-directional sowing) in utilization of moisture, nutrients and solar energy (Dhillon and Kler, 1981). Similarly, closer (15 cm sowing) sowing is able to enhance wheat yields (Vaishya and Singh, 1981). However, no information is available regarding effectiveness of these planting geometries in wheat under eco-edaphic conditions of Maharashtra, this study was undertaken.

MATERIALS AND METHODS

The field experiment was conducted during the winter (*rabi*) seasons of 1986-87

and 1987-88 at Akola. The soil was clayey in texture, medium in nitrogen, phosphorus and organic carbon and fairly rich in potash, with pH 7.7. The soil had electrical conductivity of 0.82 mmhos/cm at 25°C. The treatments were 2 genotypes ('HD 2189' and 'NI 5439') and 3 levels of manual weeding (no weeding, 1 weeding at 30 days and 2 weedings at 30 and 60 days after sowing) as main plots and 4 methods of planting (normal sowing at 22.5 cm, closer sowing at 15 cm, cross-sowing at 22.5 cm and cross-sowing at 15 cm) as subplots. Treatments were arranged in split-plot design with 4 replications. Sowing was done on 25 November in 1986 and on 27 November in 1987. A seed rate of 125 and 100 kg/ha was used for 'HD 2189' (seed weight 38-40 g/1,000 grains) and 'NI 5439' (seed weight 35-38 g/1,000 grains) respectively as per recommendation. Fertilization was done @

Table 1. Effect of genotype, manual weeding and methods of sowing on yield attributes of wheat

Treatment	Height (cm)		Effective tillers/m ²		Ear length (cm)		Grains/ ear		Grain weight/ ear (g)		100-grain weight (g)	
	1986- 87	1987- 88	1986- 87	1987- 88	1986- 87	1987- 88	1986- 87	1987- 88	1986- 87	1987- 88	1986- 87	1987- 88
<i>Variety</i>												
'HD 2189'	95.40	94.70	192	200	10.23	9.44	40.80	38.30	1.45	1.43	39.10	39.60
'NI 5439'	107.10	106.80	233	241	8.35	8.77	36.90	35.70	1.37	1.37	37.80	38.50
CD (P = 0.05)	1.24	1.82	12.67	4.95	0.14	0.33	0.91	0.69	0.01	0.02	0.49	0.49
<i>Weeding</i>												
Weedy check	100.50	98.80	182	190	9.16	8.91	36.70	35.50	1.37	1.36	37.10	37.80
1 weeding	101.20	100.30	210	219	9.30	9.09	39.00	36.90	1.41	1.39	38.50	39.00
2 weedings	102.10	103.20	245	252	9.41	9.31	40.90	38.70	1.45	1.44	39.80	40.40
CD (P = 0.05)	NS	2.22	15.52	6.06	0.17	NS	1.11	0.85	0.01	0.02	0.60	0.60
<i>Sowing method</i>												
Normal sowing 22.5 cm	100.00	98.90	199	208	9.20	9.00	38.00	36.20	1.38	1.37	37.90	38.60
Closer sowing 15.0 cm	101.50	101.00	214	222	9.32	9.11	36.80	37.10	1.41	1.40	38.60	38.90
Cross-sowing 22.5 cm	101.40	102.50	222	231	9.38	9.19	40.00	37.90	1.44	1.42	39.20	39.70
Cross-sowing 15.0 cm	102.00	100.70	214	222	9.26	9.12	38.70	36.80	1.41	1.40	38.20	39.00
CD (P = 0.05)	0.95	NS	14.17	5.88	NS	NS	1.27	NS	0.02	0.02	0.64	0.70

100, 50 and 50 kg/ha of N, P_2O_5 and K_2O respectively, of which half of N and total P and K were applied at sowing and the remaining half N was applied at first irrigation applied at 21 days after sowing.

RESULTS AND DISCUSSION

Yield attributes

Variety 'NI 5439' was significantly taller than 'HD 2189'. 'NI 5439' produced significantly more number of effective tillers/m² than 'HD 2189' (Table 1). Effective tillers and plant height increased progressively with an increase in level of manual weeding. The plants of closer and cross-sowing were taller than of normal sowing. Cross-sowing at 22.5 cm produced

significantly more number of tillers/m² than all other methods of sowing during 1987–88 and than normal sowing only during 1986–87. Closer sowing also produced significantly more number of tillers than normal sowing. Similar results were obtained by Dhillon and Kler (1981) and Prakash *et al.* (1986). The variety 'HD 5439' recorded significantly more ear length, grains/ear, grain weight/ear and 1,000-grain weight than those of 'NI 5439'. All yield attributes except ear length were increased significantly with increase in the level of manual weeding. Methods of sowing did not show any effect on ear length, while improvement in other yield attributes was observed under cross-sowing at 22.5 cm than under normal sowing at 22.5 cm.

Table 2. Weed-dry matter, grain and straw yields of wheat as influenced by genotype, manual weeding and methods of sowing

Treatment	Weed-dry weight (g/m ²)		Grain yield (q/ha)			Straw yield (q/ha)	
	1986–87	1987–88	1986–87	1987–88	Pooled	1986–87	1987–88
<i>Variety</i>							
'HD 2189'	66.90	67.00	27.67	27.35	27.51	41.90	43.20
'NI 5439'	53.50	54.00	30.23	30.31	30.27	44.80	47.40
CD (P = 0.05)	1.60	3.47	1.27	0.69	0.77	1.50	1.05
<i>Weeding</i>							
Weedy check	111.80	113.50	24.66	24.41	24.54	38.50	39.90
1 weeding	57.00	56.50	29.03	29.15	29.09	43.30	45.70
2 weedings	11.70	11.30	33.17	32.19	33.05	48.30	50.30
CD (P = 0.05)	1.96	4.25	1.56	0.84	0.95	1.84	1.28
<i>Sowing method</i>							
Normal sowing 22.5 cm	66.60	67.00	27.29	26.65	26.97	41.90	42.90
Closer sowing 15.0 cm	60.10	61.00	29.26	28.90	29.08	43.60	45.20
Cross-sowing 22.5 cm	55.00	54.40	30.02	30.67	33.35	44.30	47.40
Cross-sowing 15.0 cm	59.00	59.50	29.25	29.09	29.17	43.70	45.60
CD (P = 0.05)	2.94	5.80	1.07	0.74	0.55	1.39	1.10

Weed-dry weight

Weed-dry matter yield recorded in 'NI 5439' was significantly lower than that in 'HD 2189' (Table 2). Dry-matter accumulation by weeds was reduced significantly with increase in the level of manual weeding. Cross-sowing at 22.5 cm and closer sowing at 15 cm produced significantly lower dry matter of weeds than normal sowing at 22.5 cm. The reduction in weed-dry matter may be attributed to the competition stress due to presence of taller plants and more number of tillers of the crop on weed growth for space, light and nutrients. The results confirm the findings of Jariyal (1984), Dhiman *et al.* (1985) and Prakash *et al.* (1986).

Grain and straw yields

Variety 'NI 5439' yielded significantly higher than 'HD 2189' (Table 2). The increase in grain yield was 10.03% compared with 'HD 2189'. Weeding twice increased the grain yield by 34.67 and 13.61% compared with weedy check and 1 weeding, respectively, whereas increase in yield due to 1 weeding at 30 days after sowing over unchecked weed treatment was 18.54%. The cross-sowing at 22.5 cm gave significantly more grain yield than all other methods of sowing. Closer sowing at 15 cm also recorded significantly higher yield than normal sowing. Increase in grain yield over normal sowing was 12.53 and 7.82% due to cross-sowing at 22.5 cm and closer sowing at 15 cm respectively. The higher grain yield may be attributed to lower dry-matter accumulation by weeds and more number of effective tillers. Ahuja and Yaduraju reported (1989) higher grain yields in cross-planting at 22.5 cm and Vaishya and Singh (1981) and Dhiman *et al.* (1985) in closer

Table 3. Interaction effect of varieties and weeding levels on grain yield (q/ha) of wheat (pooled data of 2 years)

Variety	Manual weeding		
	Weedy check	1 weeding	2 weedings
'HD 2189'	21.99	27.25	33.30
'NI 5439'	27.09	30.93	32.79
CD (P = 0.05)		1.34	

planting.

The straw yield followed similar trend to that of grain yield in both the seasons. Although both the varieties were statistically equal in respect of grain yield in pooled results under 2 weedings treatment, 'NI 5439' under weedy check had similar grain yield to that of 'HD 2189' under 1 weeding treatment (Table 3).

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