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Effect of Seed Rate and Dibbling on Growth, Yield Attributes and Yield of Different Varieties of Wheat (*Triticum aestivum*) in Madhya Pradesh, India

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A B S T R A C T

Field experiment was conducted at Research Farm AICRP on Wheat Department of Plant Breeding and Genetics, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.) during Rabi season, 2016-17. The experiment consisted of 12 treatment combinations viz. in main plot 2 seed rates (50 and 100 kg/ha at 20 cm) and 3 spacing (15x15, 20x 15 and 20x20 cm dibbling) and whereas sub plot included genotypes (HI 1544, HI 8737). The highest yield was obtained in dibbling 15x15 cm (50.13 q/ha) followed by line sowing @ 20 cm with seed rate of 100 kg/ha (49.54q/ha) but the differences were not significant. The increment in yield may be attributed to higher number of earheads/sq. m. The other planting options recorded significantly lower yield as compared to these two methods. The cultivar HI 8737 yielded significantly higher (47.91q/ha) as compared to HI 1544 (46.43 q/ha).

Introduction

Wheat is the largest cultivated crop with an estimated area of 220.19 million hectares (mha), and barley is grown in 50.55 mha. The nutritious cereals altogether have been under cultivation in 270.74 mha with an estimated production of 932.89 million tonnes (mt) for the period 2018-19 (UDSA, 2019). In India, during 2018-19 Rabi season, wheat was cultivated in 29.55 mha and barley in 0.66 mha, constituting 24.35 per cent of the total crop acreage. India harvested an all time record wheat production of more than 97 million tonnes during the year 2016-17 despite shrinking land and water resources, climate abrasions and little genetic gain. This has been made possible by Indian farmers and scientists through efficient management of natural resources and various external inputs like chemical fertilizers and pesticides. Wheat is generally planted by broadcast method by most of the farmers in the country and only progressive farmers and researchers use line

sowing. Now-a-days due to infestation of weeds, it has become necessary to sow the crop in lines with a suitable row spacing, which may help in cultural operations, herbicides application, inter-cropping and increasing or decreasing seed rate without any adverse effect on the final grain yield. Proper row spacing is important for maximizing light interception, penetration, distribution in crop canopy and average light utilization efficiency of the leaves in the canopy, and thus affect yield of a crop. Wider spacing between rows or pairs of rows, not only allow more light to reach the lower leaves at the time of grain formation but also allows easy inter-culture for weed control and inter-cropping (Biswas *et al.,* 1999). The wheat productivity greatly depends on availability of nutrients and moisture, besides the climatic factors. Farmers in Kymore plateau often face problem in rabi crop sowing due to delayed harvesting of kharif crop. Plant population also affects wheat yield considerably. There fore, the optimum seeding rate is crucial for getting high yield of wheat in various regions (Lloveras, *et al.,* 2004). Sowing depth significantly influences the emergence and vigor of seedlings contributing greatly to crop stand and yield (Roy *et al.,* 2011). In the future scenario of climate change better agronomical practices would help in adaptation and resilience of crops. The present study was undertaken to identify optimum seeding rate and sowing depth of wheat for better yields in Kymore plateau region of Madhya Pradesh.

Materials and Methods

Field experiment was conducted at Research Farm AICRP on Wheat Department of Plant Breeding and Genetics, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.) during Rabi season, 2016-17. The topography of the field in experimental area was fairly uniform. All facilities including irrigation water were adequately available on the research farm to carry out the field experiment. texture with 236.8 kg/ ha available N (Subbaih and Asija, 1956), 20.10 kg/ha available P (Olsen et al., 1954), 272.3kg/ha available K (Jackson, 1967) 0.62% organic carbon and soil pH of 7.3 (1:2.5 soil and water ratio). This trial was conducted in split plot design to evaluate the effect of planting options and spacing on wheat productivity. The experiment consisted of 12 treatment combinations viz. in main plot 2 seed rates (50 and 100 kg/ha at 20 cm) and 3 spacing (15x15, 20x 15 and 20x20 cm dibbling) and whereas sub plot included genotypes (HI 1544, HI 8737). NPK was applied in the ratio of 120:60:40 (1/3rd N, full P & K as basal and the remaining 2/3rd nitrogen as 1/3rd at first irrigation and next 1/3rd at second irrigation. Crop was grown under optimal crop management practices with 120 kg N, 60 kg P2O5 and 40 kg K2O/ha. Irrigation was provided as per the need of crop. Crop was kept weed free by regular hand weeding. The data on growth parameters, yield attributes and yields were recorded as per the standard procedures.

Results and Discussion

Plant population

The initial plant population significantly higher (132.11 m^{-2}) was recorded under the dibbling of (20x 15 cm dibbling). The significantly differences were not observed among the dibbling of 15x15, 20x 15 cm. The plant population at harvest were recorded (167.8 m^{-2}) higher in seed rate 50 kg at 20 cm apart (Table 1). The minimum plant population were observed under the sowing of 8737) as compare to HI 1544. The same results were reported by Yadav *et al.,* (2001).

Yield attributes

Growth of wheat was affected by different seeding rates. Leaf area index and number of

tillers/m^2 were maximum with seed rate of 50 kg/ha, which was on par with 100 kg/ha, b (Table 1). Similar findings were also reported by Sen *et al.*, (2003). Effective tillers were more with 50 kg seed/ha. and dibbling at 20x 15 cm with variety HI 1544. Yield attributes such as grains/spike, grains weight/spike and 1,000 grains weight were on par with 20x 15 cm with variety HI 1544 under the seed rate 50 kg /ha. These results supported the findings of Kumar *et al.*, (2002) and Singh *et al.*, (2005).

Table.1 Effect of different treatments on growth and yield attributes characters in wheat

Treatments	Plant population	Plant Height	Leaf area index at 30	Leaf area index at 60	Earhead/ sq.m.	Grains/ Earhead
Seed rate						
50kg	167.8	73.89	2.69	4.57	379.8	23.8
100 kg	149.8	72.87	2.72	4.60	349.8	23.8
CD at 5%	1.23	0.21	0.07	0,87		
Spacing						
Spacing (15X15 cm)	213.8	72.55	2.89	4.84	533.8	17.8
Spacing (15X20 cm)	224.8	74.67	2.76	4.64	494.8	19.8
Spacing (20X20 cm)	214.8	71.23	2.62	4.65	441.8	22.8
CD at 5%	1.11	0.23	0.56	0.87		
Varieties						
HI 1544	194.8	73.45	2.77	4.67	413.8	23.8
HI 8737	217.8	75.67	2.65	4.33	264.8	27.8
CD at 5%	1.34	0.45	0.04	0.55	1.89	0.44

Table.2 Effect of different treatment on economics

Treatments	Cost of Cultivation Rs/ha	GMRs Rs/ha	NMRs Rs /ha	B:C ratio
Seed rate				
50kg	25500	67999	42499	2.67
100 kg	26785	62876	36091	2.35
CD at 5%	2349	2876	1234	0.08
Spacing				
Spacing (15X15 cm)	26667	65876	39209	2.47
Spacing (15X20 cm)	26567	67555	40988	2.54
Spacing (20X20 cm)	26333	72654	46321	2.76
CD at 5%	1769	2346	1568	
Varieties				
HI 1544	26452	68975	42523	2.61
HI 8737	26432	73456	47024	2.78
CD at 5%	1654	2543	1678	0.06

Table.3 Effect of different treatments on yield in wheat

Seeding Method & Spacing	Variety	Earhead/ sq.m.	Grains/ Earhead	1000 Grains Weight, g	Yield, q/ha	Biomass, q/ha
50 kg seed	HI 1544	379.8	23.8	49.8	42.11	69.32
	HI 8737	349.8	23.8	52.3	40.41	73.74
100 kg seed	HI 1544	361.8	25.8	46	40.41	80.2
	HI 8737	296.8	24.8	51.8	36.15	74.59
Spacing (15X15 cm)	HI 1544	633.8	17.8	47.8	49.59	75.78
	HI 8737	494.8	19.8	54.3	49.08	78.67
Spacing (15X20 cm)	HI 1544	441.8	22.8	48.1	45.17	79.52
	HI 8737	430.8	20.8	52.5	42.62	65.75
Spacing (20X20 cm)	HI 1544	413.8	23.8	49.8	45.17	72.38
	HI 8737	264.8	27.8	56.1	39.04	68.98
SEm±		1.79	3.59	2.548	3.23	2.78
CD (5%)		3.79	5.59	3.385	4.82	3.88

Yield

There was significant different in grain yield between two variety. The wheat variety HI 1544(average 42.69 q/ha) produced significant higher grain yield than HI8737 (average 39.66 q/ha.). Among planting method dibbling at (15x15 cm.) Produced the highest and significant higher grain yield than all the other treatment. The next best planting method was sowing at 15x20 cm. The highest yield was obtained in dibbling 15x15 cm (50.13 q/ha) followed by line sowing @ 20 cm with seed rate of 100 kg/ha (49.54q/ha) but the differences were not significant. The increment in yield may be attributed to higher number of earheads/sq. m. The other planting options recorded significantly lower yield as compared to these two methods. The cultivar HI 8737 yielded significantly higher (47.91q/ha) as compared to HI 1544 (46.43 q/ha). Sharma and Malik, 1993 and Biswas *et al.,* 1999 also found the similar findings.

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