Indian Journal of Agronomy **58** (2): 259–261 (June 2013)

Research Communication

Effect of seed rate and sowing depth on growth, yield attributes and yield of irrigated wheat (*Triticum aestivum*) in Madhya Pradesh

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Received : September 2012; Revised accepted : May 2013

ABSTRACT

A study was conducted in Kymore Plateau and Satpura Hills regions of Madhya Pradesh during *rabi* season of 2009–10, to evaluate the effect of 4 seed rates (40, 60, 80 and 100 kg/ha) and 3 seeding depths (2, 4 and 6 cm) with wheat {*Triticum aestivum* (L.) emend. Fiori & Paol} variety 'GW-273'. A seed rate of 80 kg/ha and 2 cm sowing depth showed maximum leaf area index, yield attributes and yield of wheat under irrigated conditions of Madhya Pradesh.

Key words : Depth of sowing, Irrigated wheat, Seed rates, Yield attributes and Yield

Wheat is one of the world's most widely cultivated food crops. It contributes 40% in the total food grain production in the country, next to rice. It is grown in 29.31 million hectare in India with the production of 85.76 million tonnes and productivity of 2.87 tonnes/ha (MOF, 2011). 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. Therefore, 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.

A field experiment was conducted during *rabi* season of 2009–10 for evaluating the effect of seed rates and sowing depths on growth, yield attributes and yield of wheat under irrigated ecosystem at Research Farm of Adharatal, Jabalpur, Madhya Pradesh. It is situated at 23° 9' North latitude and 79°58' East longitudes with an altitude of 411.8 meters above the mean sea level. The soil of experimental field was sandy clay loam in 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). The experiment consisted of 12 treatment combinations *viz.* 4 seed rates (40, 60, 80 and 100 kg/ha) and 3 sowing depths (2, 4 and 6 cm). Wheat variety 'GW-273' was sown on 4 December 2009 with a row spacing of 20 cm in a factorial randomized block design with three replications. Crop was grown under optimal crop management practices with 120 kg N, 60 kg P_2O_5 and 40 kg K_2O/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.

Growth of wheat was affected by different seeding rates. Leaf area index and number of tillers/m^2 were maximum with seed rate of 80 kg/ha, which was on par with 100 kg/ha, but superior over lower seed rates of 60 kg/ha and 40 kg/ha (Table 1). Similar findings were also reported by Sen *et al. (*2003). Effective tillers were more with 80 kg seed/ha. Yield attributes such as grains/spike, grains weight/spike and 1,000 grains weight were on par with 80 and 100 kg seed rate/ha. These results supported the findings of Kumar *et al*. (2002) and Singh *et al*. (2005). With seed rate of 80 kg/ha, the grain yield was

Based on part of M.Sc. thesis of the first author submitted to JNKVV Jabalpur, Madhya Pradesh during 2011 (Unpublished)

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Table 1. Growth parameters and yield attributing characters of wheat as influenced by seed rate and depth of sowing

Treatment	Leaf area index		Tillers/m^2		Yield attributing characters			
	30 DAS	90 DAS	60 DAS	At harvest	Grains/ spike	Grains wt./spike	1,000–grains wt.(g)	Effective tillers/m^2
Seed rates (kg/ha)								
40	2.69	4.57	356	378	54.2	1.7	43.3	328
60	2.72	4.60	369	388	54.4	1.8	43.6	340
80	2.89	4.84	392	414	54.7	1.8	44.0	391
100	2.76	4.64	374	395	54.0	1.7	42.9	367
SEm±	0.046	0.068	6	7	1.51	0.07	0.67	17
CD (P=0.05)	0.14	0.20	18	20	NS	NS	NS	49
Sowing depths (cm)								
2	2.87	4.79	388	408	55.1	2.0	42.9	372
4	2.76	4.69	373	396	52.9	1.9	41.2	357
6	2.66	4.51	357	378	49.3	1.7	41.1	341
SEm±	0.039	0.035	5	4.0	1.00	0.08	0.57	3.0
CD (P=0.05)	0.11	0.11	15	13.0	2.55	0.21	1.45	8.0

Table 2. Yield and harvest index of irrigated wheat as influenced by seed rate and depth of sowing

Treatment	Grain yield (t/ha)				Straw yield (t/ha)				Harvest index (%)			
	Sowing depths				Sowing depths				Sowing depths			
Seed rates (kg/ha)	2 cm	4 cm	6 cm	Mean	2 cm	4 cm	6 cm	Mean	2 cm	4 cm	6 cm	Mean
40	5.20	4.33	4.12	4.55	9.07	8.17	7.94	8.39	36.4	34.6	34.2	35.1
60	5.39	4.68	4.50	4.85	9.09	8.38	8.30	8.59	37.2	35.8	35.1	36.0
80	6.15	6.03	6.00	6.07	9.44	9.62	9.44	9.50	38.9	39.0	38.9	39.0
100	5.60	5.76	4.81	5.39	9.36	9.41	8.48	9.08	37.4	38.0	36.1	37.6
Mean	5.59	5.20	4.86		9.24	8.89	8.54		37.5	36.8	37.5	
	S	D	S × D		S	D	S × D		S	D	S × D	
SEm±	0.32	0.15	0.26		0.24	0.13	0.22		0.74	0.85	1.48	
CD (P=0.05)	1.00	0.40	0.75		0.67	0.32	0.64		2.50	NS	NS	

highest (6.07 tonnes/ha) and was significantly superior to other seed rates. Yield were declined at higher seed rate (100 kg/ha) as compared to 80 kg/ha and can be attributed to reduced number of tillers and effective tillers (Table 2). At higher seed rate, there was death of plants in early stage of growth due to more competition for the resources. Yields among the treatments was in the order of $S_3 > S_4 > S_2 > S_1$. The response was similar in straw yield and consequently in harvest index also. Similar findings were reported elsewhere by (Sharma and Malik, 1993, Biswas *et al.* 1999).

Growth and other yield parameters were influenced by different sowing depths. Number of tillers/m^2, leaf area index and dry matter production were decreased with increasing sowing depths below 2 cm. Sowing seeds deeper than 4 cm decreased the seed production owing to a greater degree (82%) of failure in emergence (Rebetzia *et al.* 2007). Similar response was also observed in straw yield.

The interaction effect of seed rate and sowing depths on growth parameters and yield attributing characters were not significant.However, 80 kg/ha seed sown at 2 cm depth were proved to be beneficial for growth and yield in wheat.

The study showed that changing seeding rates and sowing depths can be helpful in achieving higher yield of wheat in Kymore plateauand Satpura Hills regions of Madhya Pradesh.

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