J. Wheat Res. 5 (2) : 61-64

Received: 16 December 2013/ Accepted: 23 December 2013

Performance of wheat varieties under different sowing dates in Jharkhand

Md. Parwaiz Alam, Satyender Kumar, Naiyar Ali, Ram Prasad Manjhi, Nargis Kumari, Rajni Kiran Lakra and Tajwar Izhar

Birsa Agricultural University
Ranchi-834 006, India

Abstract

The field experiment was conducted at Birsa Agricultural University during 2010-11 and 2011-12 with objective to evaluate the performance of wheat varieties under different sowing dates. The experiment comprised of two dates of sowing i.e. 25th November and 20th December with five wheat varieties namely Raj 4229, K 0906, K 0307, HD 2733 and DBW 39. The experiment was laid out in split plot design replicated four times. The soil of experimental plot was sandy loam in texture having low nitrogen (252.4 Kg ha^{-1}), phosphorous (12.1 Kg ha^{-1}) and medium in potassium (155.6 Kg ha^{-1}) with soil pH 6.1. Sowing of wheat on 25th November resulted in expressing significantly more total tillers (420 tillers m^{2}), higher dry matter accumulation (1190 g m^{-2}), higher crop growth rate (19.30 g m^{-2} /day) at maturity, and leaf area index (3.60) resulted in 14.7 per cent higher spike m^{-2} (400 spikes m^{-2}), 26.43 per cent higher spike length (10.40 cm), 15.15 per cent higher number of grain per spike (39 grains/spike), 45.20 per cent higher grain yield (51.00 q ha^{-1}). Wheat sown on 25th November achieves higher net return of ₹ 37400 with benefit: cost ratio of 1.34 which is 88.70 per cent higher than 20th December sown wheat. Among wheat varieties K 0307 proved superiority in total tillers (492 m^{-2}), dry matter accumulation (1120.60 g m^{-2}), grain yield (45.40 q ha^{-1}), net return (₹ 31090 ha^{-1}) and benefit: cost ratio (1.14) than that of mean of rest of the four varieties i.e. Raj 4229, K 0906, HD 2733 and DBW 39.

Keywords: Wheat, varieties, yield, economics

Introduction

Wheat (*Triticum aestivum* L.) is the world's most widely cultivated cereal crop. It finds a major place in both time meals of common population in major wheat growing states. The cultivation of wheat has also been symbolic of green revolution, self-sufficiency in food and sustained production. As a result of technological innovation, the country which produced only 5.6 million tons at the time of independence (1947-48) is now producing 92.46 million tons in an area of 29.62 million hectares (2012-13) with average productivity of 3.12 tons per hectare (Anonymous 2013). India ranks second among wheat producing country in the world. This phenomenal increase in production is by and large attributed to adoption of high yielding varieties. The contribution of wheat is maximum as a result of its wide adaptability occupying in nontraditional rice growing area in eastern India as well as late sown and problematic areas about from the amenability to technological innovation. Wheat maintains superiority in area, production and versatility in adopting a wide range of agro climates. Nevertheless, the progress should not make us contented as the country face countless challenges in the form of population growth coupled with decreasing arable land, depleting water resources and climate change. Increasing population leads to an increase demand of wheat with no possibility in further increase in area due to growing urbanization. In plateau region of Jharkhand, wheat is grown as a second crop in sequence after *kharif* crops. At present wheat production in state faces large gap in potential and realized yield. In Jharkhand, wheat is grown in about 86341 hectare with production of 1.40 lakh tons. Among production factors, sowing time and wheat varieties are the most crucial factors deciding its productivity. Sowing of wheat in Jharkhand generally starts from November and ends in late December depending on the weather; topography and harvesting of the preceding crop. Under late sown conditions, wheat face low temperature in the earlier part and high temperature in the later part of the growing season and require favourable moisture for better growth and development. Late planting of wheat is one of the major reasons of yield reduction because of rice- wheat cropping system. In Jharkhand, late planting of wheat expressed to high temperature at reproductive stage causes reduced grain yield. About 80 per cent of the wheat crop cultivated at late sowing condition after harvesting the transplanted rice and this problem will be further increased due to global warming. In spite of low yield of wheat due to post anthesis heat stress, cultivation of wheat cannot be avoided totally. Therefore, efforts ought to be made to minimize the effect of temperature variation caused due to changed sowing date by choosing appropriate wheat varieties which can synchronize its temperature requirement.

* Corresponding author's email: *prwzalam66@gmail.com*

Materials and methods

The field experiment was conducted during the *rabi* season of 2010-11 and 2011-12 at Birsa Agricultural University,

Ranchi (23^0 17'N latitude, 85^0 10'E longitude and 625m above Mean Sea Level), India to assess the performance of wheat varieties under different sowing dates . The experiment was laid out in split plot design replicated four times. The treatment comprised of two dates of sowing i.e. 25th November and 20th December in main plots and five wheat varieties namely Raj 4229, K 0906, K 0307, HD 2733, and DBW 39 in sub plots. The soil of the experimental field was sandy loam in texture having low nitrogen (252.4 Kg ha^{-1}) and phosphorous (12.1 Kg ha^{-1}) and medium in potassium (155.6 Kg ha^{-1}) with soil pH 6.1.The total rainfall received during crop growth period was 61.3mm. The mean minimum and maximum temperature throughout the cropping season ranged from 7.82^0 to 34.70^{0}C during 2010-11 and 8.02 to 35.76^{0}C during 2011-12. The wheat was sown in rows at 22.5 cm apart as per treatment scheduled. The crop received 50 per cent of nitrogen (60 kg ha^{-1}), full dose of P (60kg ha^{-1}) and K (40 kg ha^{-1}) as basal, while remaining nitrogen was top dressed with equal half doses at tillering and at boot stage. The sources of nutrient were urea, DAP and muriate of potash for N, P and K, respectively. Post-emergence application of isoproteuron was given 30 days after sowing followed by one hand weeding for complete check of weed at critical period of crop-weed competition. Other management practices were applied as recommended for the crop under irrigated condition. The crop was harvested on 25th April and 30th April, during 2011 and 2012 respectively. Data on growth, yield component and yield were recorded as per normal procedure. In calculation of economics, the purchase rates of input and the selling rates of outputs were assumed as per the prevailing local market rates.

Results and discussion

Crop growth characters: Date of sowing significantly influenced the growth character viz. plant height, dry matter accumulation, total number of tillers per m^2 at maturity, crop growth rate (CGR). Plant height was significantly more on 25th November than the 20th December. Tahir *et al.*, (2009) also observed that early sowing results in higher dry matter accumulation, total number of tillers per m^2**.** Significantly higher maximum dry matter was observed at maturity in the treatment where wheat was sown at 25th November as compared to 20th December. Wheat sown on 25th November recorded maximum tillers per m^2 which was 15.7 percent higher than 20th December sown wheat. The LAI was significantly higher at 80 DAS in the treatment where wheat was sown at 25th November as compared to 20th December. The wheat sown on normal date of sowing (25th November) attained 15 days late physiological maturity as compared to late sown condition. Similarly Shahzad *et al.*, (2002) also reported higher plant height and dry matter accumulation of wheat under timely sowing dates.

Wheat genotypes did not show significant difference for plant height and days to maturity. Higher plant dry matter accumulation was recorded with K 0307 which was significantly superior to Raj 4229 and DBW 39 but at par with HD 2733 and K 0906. During 60-80 DAS the crop growth rate of varieties Raj 4229, K 0906, HD 2733 and DBW 39 were at par with each other but the variety K 0307 showed significant superiority over all the varieties. However at maturity wheat variety K 0307 produced significantly higher total tiller over all varieties. The total tiller produced by variety HD 2733 and K 0906 were at par among themselves but significantly superior

Table 1. Effect of date of sowing and varieties on growth parameters of wheat (pooled mean data)

Treatment	Plant height	Dry matter	CGR (g/m^2/day) 60-80DAS	LAI	Days to maturity	Total tillers/m^2
Date of sowing						
November 25th	99.30	1190.80	19.30	3.60	124	420
December 20th	88.20	940.10	17.80	2.80	109	360
SEm±	2.00	17.10	0.50	0.04	1.53	11.90
CD(0.05)	9.10	77.10	NS	0.18	6.87	53.70
Varieties						
Raj 4229	95.73	1010.40	17.00	3.10	115	305
K 0906	92.54	1050.70	17.70	3.10	116	392
K 0307	93.66	1120.60	21.20	3.50	119	492
HD 2733	91.05	1086.70	18.80	3.15	116	406
DBW 39	90.80	1030.50	18.10	3.10	115	348
SEm±	4.23	30.60	0.70	0.10	4.18	11.60
CD (P=0.05)	NS	89.30	2.00	0.34	NS	34
CV (%)	12.91	9.1	10.60	9.90	11.5	8.48

over DBW 39 and Raj 4229. The wheat variety DBW 39 was also significantly superior over Raj 4229 with respect to total tiller per meter^2. At 80 DAS the LAI of variety K 0307 , K 0906 and HD 2733 were at par with each other, but the variety K 0307 showed significant superiority over Raj 4229 and DBW 39. These results are similar to those of Mishra, (2006).

Yield attributes, yield and economics: All yields attributes were significantly affected by the date of sowing. Delayed sowing decreased grains per spike, number of spikes per meter^2 and 1000- grain weight, (Table 2). Sowing at November 25th significantly influenced the entire attributing characters and significantly superior than the 20th December sowing. Analysis revealed that the timely sown condition brought about 14.7 per cent higher number of spike per meter^2 compare to late sown condition. This might be due to prevailing of favourable temperature required for wheat crop for higher Photosynth ate accumulation consequently resulting in higher yield parameters in November 25th. This results also in conformity to that of Kaur *et al.*, (2010), Pandey *et al.*, (2010) and Mukherjee (2012).

Further, data revealed that grains per spike, spike length and 1000 grain weight were significantly higher at November 25th sowing as compared to 20th December. These results are in the line with those of Shehzad *et al.*, (2002). Decreased in test weight in December 20th due to delay sowing was mainly due to reduction in growth period and shriveling of grain due to high temperature prevailed during milk and grain filling stage. Higher grain yield in timely planting wheat was also recorded by Ram *et al.* (2012) due to increased higher growing degree days, photo-thermal units and yield attributes.

Table 2. Effect of date of sowing and varieties on yield attributes, yield and economics of wheat (pooled mean data)

Treatment	Number of spikes m^{-2}	Spike length (cm)	Number of grains /spike	1000- grain weight(g)	Grain yield (q ha^{-1})	Harvest index (%)	Net return (₹ 000/ha)	B:C ratio
Date of sowing								
November 25th	400	10.4	39	44.10	51.00	41.90	37400	1.34
December 20th	350	8.25	34	40.30	35.2	39.30	18700	0.71
SEm±	10.40	0.12	1.02	0.60	1.3	0.17	1600	0.06
CD(0.05)	47.00	0.60	5.00	3.0	5.70	0.80	7200	0.27
Varieties								
Raj 4229	360	8.95	33	39.70	39.30	39.50	23380	0.85
K 0906	375	9.50	35	41.50	44.00	40.70	29200	1.07
K 0307	380	9.60	40	45.55	45.40	41.50	31090	1.14
HD 2733	380	9.50	37	42.50	45.30	41.00	30820	1.13
DBW 39	370	8.90	34	41.50	41.50	40.50	26000	1.00
SEm±	14.9	0.30	1.44	0.63	1.40	0.70	1690	0.06
CD (P=0.05)	NS	NS	4.00	1.82	4.0	NS	4940	0.20
CV (%)	11.31	7.90	11.50	4.20	8.90	4.94	17.0	16.50

Variety K 0307, recorded 2.9 per cent higher spikes 4.77 per cent higher spike length , 13 per cent more grain per spike and 10 per cent higher 1000- grain weight than that of recorded with varieties Raj 4229, K 0906, HD 2733 and DBW 39. The higher yield attributes of K 0307 can be due to prevailing of favourable temperature required for wheat crop variety for higher Photosynthate accumulation consequently resulting in higher yield. Patel *et al.*, (1999), Akhtar *et al.*, (2002) and Kumar *et al.*, (2005) also observed similar trend among the different varieties. The wheat sown on 25th November produced significantly higher grain yield than 20th December sown wheat. Among varieties K 0307 was significantly superior over Raj 4229 but remained at par with K 0906, HD 2733 and DBW 39. However, HD 2733 was significantly superior over Raj 4229 but remained at par with DBW 39, K 0906. Similarly, K 0906 was significantly superior over Raj 4229 but remained comparable to HD 2733 and DBW 39. The timely sown condition produced significantly higher harvest index than late sown condition. The different varieties also failed to cause significant effect on harvest index. Ram *et al.* (2012) also reported similar genotype variation in yield and harvest index.

Net returns and benefit: Cost was higher with November 25th sowing and minimum in December 20th sowing. Among all varieties, maximum net return and benefit: cost ratio was recorded with cultivar K 0307 followed by HD 2733 and K 0906.

References

1. Anonymous (2013). Progress Report 2012-2013. Directorate of Wheat Research, Karnal, India pp.1
2. Akhtar M, Cheema MS, Ali L and Jamil M (2002). Sowing date cum varietal trial on wheat. *Asian Journal of Plant Science* **1**(5):550-551.
3. Kaur Anureet, Pannu RK and Buttar GS (2010). Impact of nitrogen application on the performance of wheat (*Triticum aestivum*) and nitogen use efficiency under different dates of sowing. *Indian Journal of Agronomy* **5**(1):40-45.
4. Kumar Satish, Kadian VS, Singh RC and Malik RK (2005). Effect of planting date on performance of wheat (*Triticum aestivum*) genotypes. *Indian Journal of Agricultural Sciences* **75**(2):03-105.
5. Mishra B (2006).Wheat research towards national food security. *Intensive Agriculture* **2**:11-13
6. Muhammad Tahir, Asghar Ali, Ather Nadeem Muhammad, Hussain, Akhtar and Khalid Farhan (2009). Effect of different sowing dates on growth and yield of wheat (*Triticum aestivum*) varieties in district Jhang. *Pakistan Journal of Life Science* **7**(1):66-6.
7. Mukherjee D (2012). Effect of sowing dates on growth and yield of wheat (*Triticum aestivum*) cultivars under mid hill situation of West Bengal. *Indian Journal of Agronomy* **57**(2):152-156.
8. Pandey B, Pandey RK, Dwivedi DK and Singh RS (2010). Phenology, heat unit requirement and yield of wheat (*Triticum aestivum*) varieties under different crop growing environment. *Indian Journal of Agricultural Sciences* **80**(2):136-140.
9. Patel SR, Thakur DS and Lal Nageshwar (1999). Yield and nutrient uptake of wheat (*Triticum aestivum*) varieties under different sowing dates. *Indian Journal of Agronomy* **44**(4):276-278.
10. Ram H, Singh G, Mavi GS and Sohu VS (2012). Accumulated heat unit requirement and yield of irrigated wheat (*Triticum aestivum* L.) varieties under different crop growing environment in central Punjab. *Journal of Agrometeorology* **14**(2):147-153.
11. Shahzad K, Bakht J, Shah WA, Shafi M and Jabeen N (2002).Yield and yield components of various wheat cultivars as affected by different sowing dates. *Asian Journal of Plant Sciences* **1**(5):522-525.