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# Effect of different sowing dates and cultivars on growth, yield and economics of wheat (*Triticum aestivum*) under mid land situation

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**Abstract**

A field experiment was conducted during the winter season of 2014-15 and 2015-16 at research farm of Krishi Vigyan Kendra, Jamui, (Bihar) to elucidate the effect of different sowing date and cultivars on yield of wheat (*Triticum aestivum* L.). The experiment was laid out in factorial randomized block design with treatment comprising three dates of sowing viz. 15th November, 23rd November and 01st December and 5 different cultivars viz. HD -2733, HD - 2824, PBW- 343, PBW-443 and UP-262 and replicate three times. Sowing at 15th November significantly influenced the plant height, effective tillers compared to the late sowing *viz.* 01st December. The no. of effective tillers and no. of grains per spike was highest with cultivars HD - 2733 (338 and 10.50) and was closely followed by (HD-2824) and significantly superior to rest of tested cultivars. Maximum grain yield (37.80 q $ha^{-1}$) was obtained with 15th November sowing which was significantly superior to the other dates of sowing. Net return Rs. 45,650was reported with 15th November sowing and was followed by 23rd November (Rs.50.365}and higher benefit cost ratio of 2.46 was also recorded with 15th November sowing. Amongst all varietal treatments, maximum net return Rs. (Rs 52,435) and benefit cost ratio (2.02) was recorded with cultivar HD - 2733 and was followed by HD-2824. To conclude, in spite of low yield of wheat due to post anthesis heat stress cultivation of wheat cannot be ignored totally. Therefore, efforts must 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.

**Keywords:** wheat, cultivars, date of sowing, rice- wheat cropping system (RWCS)

## Introduction

Wheat (*Triticum aestivum* ) is second most important and widely cultivated cereal crop of the world. In Bihar, it is cultivated over an area of 22 lakh ha with a total production of 47 million tones and an productivity of 2143 kg $ha^{-1}$. The major challenge to wheat production in the district is enhancing its productivity and profitability. Late planting of rice continuous till last week of August to first week of September under rainfed ecology owing to late availability of rain water for nursery raising and transplanting. This delays rice harvesting. Due to uncertainty of the rain water the farmers are adopting late maturing rice varieties for mid lands and low lands which ultimately delays sowning of wheat. The delay of every successive day in planting beyond November third week decreases the grain yield progressively (Ali *et al*., 2010, Irfaq *et al*., 2005 and Sharma 1992) [1]. Delayed wheat sowing after mid November in Trans of Indo- Gangetic plains and late November in middle Indo-Gangetic Plains results in grain yield losses of one percent per day (Hobbs *et al*., 1997) [6]. Wheat is the king of cereals and provides more nourishment (rich in carbohydrates). In India, wheat production has increased from 11.0 million Mt during 1960-61 to 93.9 million Mt during 2011-12. It covers an area of 30 million hectares with an average yield of 3117 kg $ha^{-1}$ (Anonymous 2012-13) [2]. Delayed sowing decreased the yield caused by reduction in the yield contributing traits like no. of tillers, no. of grains $spike^{-1}$ and grain yield (Ansary *et al*. 1989) [3]. Rajpoot and Verma (1994) observed that normal sowing gave higher grain yield than late sowing. Early sowing always produces higher yield than late sowing. Late sowing of wheat tends to reduce germination count and number of tillers per unit area because of sharp rise in temperature during tillering phase of the crop and ultimately yield is decreased (Soomro and Ood 2002). Optimum planting time range of different cultivars varies with regions depending on growing conditions of a specific tract that could be assessed by planting them at different times (Costa *et al.* 2013) [4]. The other crucial factor is that wheat cultivars are mainly selected for higher yields, greater tolerance to adverse conditions and shorter maturity (Zia-ul Hassan M. *et al.* 2014) [11]. Many high yielding varieties have been evolved and recommended for general cultivation in the recent past.

## Materials and Methods

The experiment was conducted during the winter season of 2014 - 15 and 2015 - 16 at research farm of Krishi Vigyan Kendra, Jamui, Bihar (25º11.075' North latitude, 86º29.385' East longitude and at an altitude of 88 meters above mean Sea level. The soil of experimental field was sandy loam in

texture, medium in organic carbon (0.60 %), available nitrogen (218.5 kg/ha), phosphorus (9.7 kg $ha^{-1}$) and $K_2O$ (72 kg $ha^{-1}$) and having pH 6.0. The total rainfall recorded during crop period were 15.6 mm and 16.8 mm, minimum temperature ranged between 4 to 16.5ºC and 3.8 to 16.6ºC and maximum temperature recorded ranged between 23.5 to 34.5ºC and 23 to 34º C during winter 2014 - 15 and 2015 - 16 respectively. The experiment was laid out in RBD (Factorial) with treatment comprising three dates of sowing viz. 15th November, 23rd November and 1st December and five different wheat cultivars *viz.* UP-262, HD - 2824, PBW- 343, PBW-443 and HD -2733 each replicated thrice. Land was prepared by two ploughing and one planking followed by pre-sowing irrigation. Wheat varieties were sown with row spacing of 20 cm. The crop was fertilized with recommended dose of 120: 60: 40. Half amount of nitrogen and full dose of phosphorus and potash were applied as basal and rest half of nitrogen was top dressed at crown-root initiation stage and maximum tillering stage respectively. The source of fertilizer was DAP, Urea and MOP for N, P and K respectively. Four irrigations were given at critical growth stages of the crop. Other management practices were adopted as per recommendation of the crop. The crop was harvested on 25th March to 10th April during both the years of experiment. Data on growth, yield attributes and yield were recorded as per normal procedure.

For studying the economics prevailing market price for wheat seed (Rs. 30$kg^{-1}$ ), DAP (Rs.25$kg^{-1}$) Urea (Rs.5.70 $kg^{-1}$) and MOP (Rs.15 $kg^{-1}$) and cost of labour Rs. 150 per day were considered. Data related to growth phase was recorded at maximum growth stages 30, 60 DAS and rest of the yield attributing character was measured at harvest.

**Table 1:** Effect of different treatments on growth of wheat (pooled data of two years)

| Treatments<br>Date of sowing | Plant height (cm) | No. of tillers/$m^2$ | Plant dry wt. (g) at harvesting time |
|---|---|---|---|
| 15 November | 98.80 | 358 | 54.40 |
| 23 November | 95.20 | 342 | 51.68 |
| 01 December | 92.78 | 338 | 49.78 |
| F-test | S | S | S |
| S.Ed. (+) | 0.37 | 1.48 | 0.46 |
| CD (P=0.05) | 1.20 | 4.84 | 1.47 |
| **W heat cultivars** | | | |
| UP 262 | 88.60 | 323 | 46.20 |
| HD 2824 | 95.00 | 340 | 50.36 |
| PBW – 343 | 90.20 | 335 | 48.60 |
| PBW – 443 | 91.25 | 337 | 49.00 |
| HD - 2733 | 97.20 | 345 | 54.15 |
| F-test | NS | NS | S |
| S.Ed. (+) | 0.35 | 0.91 | 1.18 |
| CD(P=0.05) | 1.55 | 6.26 | 1.90 |
| **Interaction** | | | |
| F-test | S | S | S |
| S.Ed. (+) | 0.42 | 1.16 | 0.51 |
| CD (P=0.05) | 2.69 | 10.84 | 3.30 |

**Table 2:** Effect of different treatments on yield attributes of wheat

| Treatments<br>Date of sowing | No. of effective tillers/m2 | Spike length (cm) | No. of grains/ spike | Test wt (g) | Grain yield q/ha | Straw yield q/ha | Harvest index (%) |
|---|---|---|---|---|---|---|---|
| 15 Nov. | 352 | 10.50 | 43.70 | 40.85 | 41.60 | 62.00 | 40.15 |
| 23 Nov. | 335 | 9.00 | 39.58 | 38.30 | 36.85 | 55.28 | 39.99 |
| 01 Dec. | 330 | 8.50 | 38.20 | 37.18 | 35.10 | 52.70 | 39.97 |
| F-test | S | S | S | S | S | S | NS |
| S.Ed. (+) | 0.99 | 0.12 | 0.22 | 0.39 | 0.41 | 0.73 | 0.62 |
| CD (P=0.05) | 3.23 | 0.40 | 0.70 | 0.98 | 1.33 | 2.37 | 2.00 |
| **Cultivars** | | | | | | | |
| UP 262 | 316 | 7.25 | 35.50 | 35.50 | 31.25 | 47.00 | 39.93 |
| HD – 2824 | 333 | 8.78 | 38.50 | 37.50 | 36.00 | 54.00 | 40.0 |
| PBW – 343 | 327 | 8.20 | 37.60 | 36.75 | 35.02 | 52.60 | 39.96 |
| PBW – 443 | 330 | 8.42 | 38.00 | 37.00 | 35.00 | 52.50 | 40.00 |
| HD - 2733 | 338 | 9.20 | 40.20 | 38.60 | 37.80 | 56.70 | 40.00 |
| F-test | S | NS | S | NS | S | S | NS |
| S.Ed. (+) | 1.03 | 0.10 | 0.32 | 0.18 | 0.36 | 0.16 | 0.43 |
| CD. (P=0.05) | 4.17 | 0.51 | 0.91 | 1.27 | 1.72 | 3.05 | 2.59 |
| **Interaction** | | | | | | | |
| F-test | S | S | S | S | S | S | NS |
| S.Ed. (+) | 1.23 | 0.11 | 0.30 | 0.19 | 0.34 | 0.57 | 0.14 |
| CD (P=0.05) | 7.23 | 0.89 | 1.58 | 2.19 | 2.97 | 5.29 | 4.49 |

**Table 3:** Effect of different treatments on economics of wheat

| Treatments / Date of sowing | Cost of cultivation Rs./ha | Gross return Rs./ha | Net return Rs./ha | B:C ratio |
|---|---|---|---|---|
| 15 Nov. | 25,200 | 87,200.00 | 62,000.00 | 2.46 |
| 23 Nov. | 26,100 | 76,465.50 | 50,365.50, | 1.93 |
| 01 Dec. | 27,200 | 72,850.00 | 45,650.00 | 1.68 |
| **Cultivars** | | | | |
| UP 262 | 26,000 | 64,887.50 | 38,887.50 | 1.50 |
| HD – 2824 | 26,000 | 74,700.00 | 48,700.00 | 1.87 |
| PBW – 343 | 26,000 | 72,691.00 | 46,691.00 | 1.80 |
| PBW – 443 | 26,000 | 72,625.00 | 46,625.00 | 1.79 |
| HD - 2733 | 26,000 | 78,435.00 | 52,435.00 | 2.02 |

## Result and Discussion

### Wheat plant growth characters

Date of sowing showed significant variation on growth characters of wheat viz. plant height, plant dry weight, no. of tillers per meter square and post harvest parameters viz. no. of effective tillers m-2, spike length, no. of grains spike-1, test weight, grain and straw yield. Plant height recorded highest value (98.8 cm) in wheat plants which were sown on 15th November followed by 23th November and Ist December respectively. Tahir et al. 2009 also observed that early sowing of wheat crop result in higher dry matter accumulation and total no. of tillers m-2. Similarly, significantly higher plant dry weight at harvest was recorded in early sown crop than later sown crop. Wheat sown on 15th November attained 10 days late physiological maturity than late sown crop. Shahzad *et al*. 2002 also reported maximum plant height, dry matter accumulation and no. of tillers m-2 under early sown crop.

Wheat genotype showed non, significant effect with respect to plant height and no. of tillers m-2. However, highest plant height (97.20 cm) was recorded with cultivar HD 2733 followed by HD 2824. Similarly maximum no. of tillers (345) was recorded in cultivar HD 2733 followed by cultivar HD 2824 (340) which was found to be at par to HD 2733 and significantly superior to all the remaining three cultivar. A significant variation was observed in plant dry weight where cultivar HD 2733 recorded maximum dry weight at harvest (54.15 g) followed by HD 2824 (50.36 g). These results are similar to those of Mishra (2006) [8].

### Yield attributes and yield:

All yield attributes were significantly affected by date of sowing. Early sown wheat crop on 15th November recorded maximum no. of effective tillers (352), spike length (10.5 cm), no. of grains spike-1 (43.70), test weight (40.85 g), grain yield (41.60 q ha-1) and straw yield (62.0 q ha-1). Sowing on 15th November significantly influenced the yield attributing character of wheat and was found to be significantly superior than that sown on Ist December. This may be due to favorable temperature required by wheat crop for higher photosynthate accumulation consequently resulting in higher yield attributing characters in 15th November sowing. These results are in conformity with the findings of Alaam *et al*. (2013).

### Economics:

A perusal of table 2 reveals that spike length, grains spike-1 and test weight were significantly higher in early sowing than late sown crop. Decrease in test weight of Ist December sown crop may be due to reduction in growth period and shriveling of grains due to high temperature prevailing during milk and grain filling stage. Higher grain yield in early sowing of wheat was also recorded by Ram *et al*. (2012) [9] due to higher growing degree days, photo thermal units and yield attributes. A perusal of the table also reveals that among cultivars all the above mentioned yield attributes were found higher in cultivar HD 2733 viz. no. of effective tillers (338), spike length (9.20 cm), no. of grains spike-1 (40.20), test weight (38.60 g), grain yield (37.80 q ha-1) and straw yield (56.70 q ha-1) followed by cultivar HD 2824 and was found to be at par to HD 2733 in all yield attributes. Harvest index, test weight and spike length showed non, significant effect in case of genotypes. The interaction effect of sowing dates and cultivars showed significant effect in all yield attributes except harvest index.

An appraisal of table 3 revels that maximum net return, B:C ratio (Rs. 62,000 and 2.46) in 15th November wheat sown crop followed by 23th November and Ist December sown crop respectively. Among cultivars HD 2733 recorded highest net return (Rs. 52,435) and B:C ratio (2.20) followed by cultivar HD 2824 recording Rs. 48,700 and 1.87 net return and B:C ratio respectively.

## References


1. Ali MA, Ali M, Sattar M. Sowing date effect on yield of different wheat varieties, Journal of Agriculture Reserch 2010; 48(2):157-162.
2. Anonymous Agriculture Statistics at a Glance. Directorate of Economics and Statics, Department of Agriculture and Coperation 2013.
3. Ansary AH, Khushak AM, Sethar MA, Ariam NA, Emon MYM. Effect of sowing dates on growth and yield of wheat cultivars. Pak J Sci. Ind. Res 1989;32:39-42.
4. Costa R, Pinheiro N, Ameida AS, Gomes C, Coutinho J, Coo J *et al.* Effect of sowing dates and seeding rate on Bread wheat yield and test weight under Mediterranean Conditions. Emir. J Food Agric. 2013;25:951-961.
5. Gangwar KS, Singh KK, Sharma SK, Tomar OK.. Alternative tillage and crop Residue management in wheat after rice in sandy loam soils of Indo-Gangetic plains. Soil Till. Res. 2005;88:242-252.
6. Hobbs PR, Giri GS, Grace P. Reduced and zero tillage options for the establishment of wheat after rice in South – Asia Rice Wheat consortium Mexico. Paper Series 1997;2:1-18.
7. Ladha JK, Fischer KS, Hossain M, Hobbs PR, Hardy B.

Improving the Productivity and sustainability of rice-wheat systems of the Indo-Gangetic Plains: A synthesis of NARS-IRRI partnership research. IRRI Discussion Paper Series No. 40. International Rice Research Institute, Makati City, Philipines, 2000.
8. Mishra B. Wheat research towards national food security. Intensive Agriculture 2006;2:11-13.
9. Ram H, Singh G, Mavi GS, Sohu VS. Accumulated heat unit requirement and yield of irrigated wheat (*Triticum aestivum* L.) varietiesunder different crop growing environment in central Punjab. Journal of Agrometerology 2012;14(2):147-153.
10. Shahzad K, Bakht J, Saha WA, Shafi M, Jabeen N. Yield and yield components of various wheat cultivars as affected by different sowing dates. Asian Journal of Plant Science 2002;1(5):522-525.
11. Zia-Ul-Hassan M, Wahla AJ, Waqar MQ, Ali A. Influence of sowing Date on the Growth and Grain Yield Performance of wheat varieties under Rainfed Condition. Sci. Tech. and Dev 2014;33(1): 22-25.