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### Effect of date of sowing and varieties on growth and yield of wheat (*Triticum aestivum* L.) in central plain zone of Uttar Pradesh

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#### Abstract

The experiment was conducted during *Rabi* season of 2018-19 at Students' Instructional Farm, Chandra Shekhar University of Agriculture and Technology, Kanpur to assess the effect of weather parameters on date of sowing and varieties on growth and yield of wheat. The field experiment included two factors, viz. dates of sowing in main-plot (15<sup>th</sup> November, 30<sup>th</sup> November, 15<sup>th</sup> December) and varieties in sub-plot (HD 2967, K 1006, K 402) was accommodated in split plot design replicated three times. On the basis of experimental study it was concluded that among sowing dates, 15<sup>th</sup> November sowing is the most economical than rest of the sowing dates. The sowing on 15<sup>th</sup> November recorded better growth, yield attributes and grain yield (4482.11 kg ha<sup>-1</sup>) and harvest index (38.09%) of wheat crop. Among wheat varieties tested HD 2967 exhibited maximum grain yield (4831.56 kg ha<sup>-1</sup>) and harvest index (38.26%) compared to other varieties. On economic parameters 15<sup>th</sup> November sowing recorded maximum Net income (Rs.72188.39 ha<sup>-1</sup>) and B: C ratio (2:73). Among varieties K-402 evaluated maximum net income (Rs.82368.13 ha<sup>-1</sup>) and B: C ratio (3:04) compared to other varieties.

**Keywords:** Sowing dates, wheat varieties, yield attributes, yield, economics

#### Introduction

Wheat (*Triticum aestivum* L.) is the first important strategic cereal crop for the majority of world's populations. It is the single most important cereal crop that has been considered as integral component of the food security system of the several nations. It has been described as the 'King of cereals' because of the acreage and high productivity which also occupies a prominent position in the international food grain trade. India has a large area under wheat and about 90% of total wheat production is India has a large area under wheat and about 90% of total wheat production is contributed by five states viz., Uttar Pradesh, Punjab, Haryana, Madhya Pradesh, and Rajasthan. The other wheat producing states are Bihar, Gujarat, Jammu and Kashmir, Maharashtra, West Bengal and Chhattisgarh. In India, Uttar Pradesh ranks first in both area (19.49 m ha) and production (54.63 m t) but the average productivity is much lower (2803 kg ha<sup>-1</sup>) than Punjab (4656 kg ha<sup>-1</sup>) and Haryana (3979 kg ha<sup>-1</sup>), respectively. (Anonymous, 2019)<sup>[2]</sup>.

In India the total food grain production for the year 2019 was 284.95 million tons and wheat occupies an area of 29.14 million hectares with the percentage of 15.23% area and productivity of 3507 kg ha<sup>-1</sup>. Singh *et al.* (2018)<sup>[4]</sup> reported that under timely sown condition, wheat crop experienced prolonged favorable growth environment which resulted in higher accumulation of carbon photosynthates and ultimately enhanced the yield attributes positively. To improve the production of wheat, as in any other crop, introduction of varieties with a high yield potential is essential. Variety contributes more than 50% of the increased production. In India, numbers of wheat varieties are cultivated but due to fast changing ecosystem these varieties become susceptible to different insects, pests and diseases which cause a decline in yield. It was thus decided to generate a steady flow of new varieties, deriving resistant from diverse sources, to replace the old varieties for sustainable higher production. From above points in view the present experiment was framed and conducted to achieve better results.

## Materials and Methods

The field experiment was conducted during *Rabi* season of 2018-19 at Students' instructional farm of Chandra Shekhar Azad University of Agriculture and Technology, Kanpur. The experiment was laid out in split plot design containing three sowing dates *viz.* 15th November, 30th November, 15th December in main plot and three wheat varieties *viz.* K-402, K-1006, HD-2967 as sub plot treatments. The experimental field soil was sandy loam in texture having 140-150 kg ha<sup>-1</sup>, 19.8 kg ha<sup>-1</sup> and 225.72 kg ha<sup>-1</sup> nitrogen, phosphorus and potassium, respectively. Seed of each variety at the rate of 100 kg per hectare was used in each sowing date. A uniform recommended dose of 150 kg N, 60 kg P<sub>2</sub>O<sub>5</sub> and 60 kg K<sub>2</sub>O ha<sup>-1</sup> was applied for wheat crop through Urea, DAP and Muriate of potash, respectively. 1/3<sup>rd</sup> dose of nitrogen and full dose of phosphorous and potassium were applied as basal and remaining 2/3<sup>rd</sup> of nitrogen was applied in two equal splits, i.e. 1/3<sup>rd</sup> nitrogen after first irrigation and 1/3<sup>rd</sup> after second irrigation.

## Results and Discussion

### Growth characters

The date of sowing affected the plant height of wheat which is higher with varieties sown on 15<sup>th</sup> November thereafter it declined as sowing was delayed in all the 3 varieties. The maximum plant height was observed in wheat variety HD 2967 followed by K 1006 and lowest plant height was observed in the variety K 402. The variety HD 2967 performs better due to its better genome characteristic as well as better growth characters and yield attributes achieved under favourable climatic conditions. The maximum tillers (470.67 m<sup>-2</sup>) and effective tillers (432.6 m<sup>-2</sup>) were recorded on wheat crop at 90DAS when crop sown on 15<sup>th</sup> November sowing compared to other dates of sowing. The tillers also differed significantly with varieties. Among the varieties HD 2967 recorded maximum tillers at 90DAS compared to all the varieties. The effective tillers is dependent on seeding rate and environmental conditions during crop growth period. All the varieties which were sown on 15<sup>th</sup> November produced higher number of effective tillers per plant but in case of the varieties K-402 produced highest number of effective tillers per plant

compared to other varieties. More or less similar findings were reported by Ainullah Habibi and Tamim Fazily (2020)<sup>[1]</sup>.

### Yield attributes and yield

Yield of wheat crop is directly related to yield attributes of the crop. Higher the values of the yield attributes more will be the crop yield. Sowing dates and varieties influenced significantly yield attributes and yield of the crop. The yield attributes *viz.*, ear length (cm), Grains ear<sup>-1</sup>, Test weight (g) were maximum with variety HD 2967 sown on 15<sup>th</sup> November while, lowest yield attributes were recorded thereafter. It is declined as delay in sowing date of three varieties of wheat. Date of sowing had significant effect on grain yield and straw yield of wheat. It was observed that all the varieties which were sown on 15<sup>th</sup> November produced higher grain yield and straw yield compared to other dates of sowing. The yield was reduced to the tune of 6.48 percent and 13.61 percent with delayed sowing during 30<sup>th</sup> November and 15<sup>th</sup> December. Among the varieties, higher grain yield and straw yield of wheat was obtained from variety HD 2967 over rest of the varieties sown in different dates of sowing. The increment in yield of wheat variety HD 2967 was recorded 18.01 percent and 30.21 percent over K 1006 and K 402 varieties. Similar finding were also reported by Mumtaz (2015)<sup>[6]</sup> and Marasini *et al.* (2016)<sup>[5]</sup>.

### Economics

The data on economic parameters *viz.*, gross return, net return and benefit cost ratio (B: C) were significantly influenced by sowing dates and varieties. Among different sowing dates, 15th November sown crop resulted in significantly higher gross return (Rs.113947.10) as compared to 15th December sowing date. Higher Net returns (Rs.72188.39) and B:C ratio (2:73) found with crop sown on 15<sup>th</sup> November sowing compared to other dates of sowing. The gross return, net return and B:C ratio are also differed significantly with varieties. Among the varieties HD 2967 recorded higher gross returns (Rs.122658.10), net return (Rs. 82368.13) and B:C ratio (3:04) over the varieties tested.

**Table 1:** Effect of date of sowing and varieties on growth and yield attributes of wheat

Treatments	Plant height (cm)	Maximum tillers (m <sup>-2</sup> ) at 90 DAS	Effective tillers (m <sup>-2</sup> ) at maturity	Length of ear (cm)	Grains/ear	Test weight (g)
<b>Date of sowing</b>						
15 <sup>th</sup> Nov	87.96	470.67	432.67	10.32	54.95	39.92
30 <sup>th</sup> Nov	85.52	442.83	398.22	10.08	52.19	39.42
15 <sup>th</sup> Dec	82.56	420.86	364.00	9.44	50.03	38.36
SE(d)±	0.236	0.345	0.287	0.103	0.156	0.071
C.D. (P=0.05)	0.674	0.984	0.818	0.293	0.445	0.203
<b>Varieties</b>						
HD 2967	412.45	459.63	412.45	10.43	54.79	40.41
K 1006	401.78	449.76	401.78	10.02	52.65	39.06
K 402	380.67	424.97	380.67	9.39	50.22	38.23
SE(d)±	0.308	0.118	0.308	0.142	0.130	0.097
C.D. (P=0.05)						
<b>Interaction</b>						
V x D						
SE(d)±	0.533	0.471	0.533	0.247	0.225	0.169
C.D. (P=0.05)	1.278	1.082	1.278	NS	0.558	0.394
D x V						
SE(d)±	0.521	0.416	0.521	0.226	0.241	0.155
C.D. (P=0.05)	1.250	0.954	1.250	NS	0.547	0.362

**Table 2:** Effect of date of sowing and varieties on yield and economics of wheat

Treatments	Grain yield (kg/ha)	Straw yield (kg/ha)	Harvest index (%)	Gross return (Rs/ha)	Net return (Rs/ha)	B:C ratio
<b>Date of sowing</b>						
15 <sup>th</sup> Nov	4482.11	7265.56	38.09	113947.10	72188.39	2.73
30 <sup>th</sup> Nov	4209.00	6983.89	37.52	107554.40	67264.38	2.67
15 <sup>th</sup> Dec	3945.00	6753.11	36.81	101391.60	62532.63	2.61
SE(d)±	28.357	15.211	0.177	600.174	569.229	0.011
C.D. (P=0.05)	80.841	43.364	0.506	1710.974	1622.755	0.032
<b>Varieties</b>						
HD 2967	4831.56	7789.78	38.26	122658.10	82368.13	3.04
K 1006	4094.00	6847.11	37.39	104819.20	64530.35	2.60
K 402	3710.56	6365.67	36.77	95415.78	55086.90	2.37
SE(d)±	22.417	20.993	0.119	534.160	573.681	0.016
C.D. (P=0.05)	49.383	46.246	0.262	1176.725	1263.786	0.036
<b>Interaction</b>						
V x D						
SE(d)±	38.827	36.36	0.206	925.192	993.644	0.028
C.D. (P=0.05)	NS	84.998	NS	NS	NS	NS
D x V						
SE(d)±	42.534	33.358	0.244	964.813	991.080	0.026
C.D. (P=0.05)	NS	77.980	NS	NS	NS	NS

### Conclusion

On basis of present study, it was clearly indicated that sowing of wheat during 15<sup>th</sup> November with variety HD 2967 was found to be the optimum recorded higher grain yield. The maximum net returns and B:C ratio with variety HD 2967 sown on 15<sup>th</sup> November found better in terms of higher profit.

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