

Effect of sowing dates and varieties on growth and yield of wheat (*Triticum aestivum* L.) in central plain zone of U.P.

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Abstract

A field experiment was conducted ~~in~~during Rabi season ~~of~~ during 2022-23 at Kanpur, on the entitled "Effect of sowing dates and varieties on growth and yield of wheat (*Triticum aestivum* L.) in central plain zone of U.P." in sandy loam soil at Student's Instructional Farm, C.S. Azad University of Agriculture and Technology, Kanpur-

208002 (U.P.). The experiment consisted of nine treatment combinations comprised of three sowing dates viz. ~~on~~ 23rd November, 8th December, and 23rd December and three varieties viz., K-307, K-9107 and HD-2967. Variety HD-2967 ~~find out was~~ yielded more than ~~the other varieties that of~~ K-307 and K-9107 ~~because of the more for the reason that~~ number of grain ear⁻¹, grain weight ear⁻¹ and test weight ~~was more in this variety as compared to other two varieties. Results reveal that~~ Sowing dates significantly influences the yield contributing characters and grain yield. The ~~maximum with higher~~ grain yield (41.66 q kha⁻¹) ~~was recorded under sowing on~~ 23rd November ~~sown crop over to the~~. It was significantly superior ~~over~~ sowing on 8th December (36.34 q kha⁻¹) ~~followed by sowing on and~~ 23rd December (33.26 q kha⁻¹). The variety HD-2967 was superior to K-307, and K-9107, respectively from yield point of view and its attributes regarding selection of varieties under three dates tested in the study was also very clear that sequence of varieties in order of preference was HD-2967, K-9107 and K-307. The study also confirmed ~~that~~ ~~consequent~~ delay in sowing ~~beyond~~ 23rd November significantly decreases the yield irrespective of varieties. Thus, it is recommended that wheat crop may be sown in month of November to obtain the higher yield.

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Key words: ~~Wheat, Grain Yield~~ yield, Sowing date, Varieties, ~~Wheat, Grain~~

Introduction

Wheat (*Triticum aestivum* L.) is most staple and second most important crop after rice in India, which contributes nearly one third of the total food grains production. It is consumed mostly in the form of bread as 'Chapati'. Wheat is grown in India in an area of about 30.46 million hectares with a production of 11294.00.75 million tonnes and

~~normal-the average~~ productivity of 3.41 tonnes per hectare [1]. Wheat provides sustenance to around 35 percent of the world's population, and it accounts for about 20% of the world's protein supply. Wheat kernels contain approximately 12 percent water, with carbohydrates (65-80 percent) primarily as starch, protein (8-15 percent) containing adequate amounts of all essential amino acids (except lysine, tryptophan, and methionine), fats (1.5-2 percent), minerals (1.5-2 percent), vitamins (such as B complex and vitamin E), and crude fibres (2.2 percent). Wheat straw is used for cattle bedding and feed. [\(Add reference\)](#).

The major wheat producing States are Uttar Pradesh, Madhya Pradesh, Punjab, Haryana, Rajasthan, Bihar, Maharashtra, Gujarat, Karnataka, West Bengal, Uttarakhand, Himachal Pradesh and Jammu & Kashmir. These States contribute almost a hundred per cent of the total wheat production in the country. ~~Remaining-The remaining~~ states, namely, Jharkhand, Assam, Chhattisgarh, Delhi, and other North Eastern states contribute only about 0.5% of the total wheat production in the country. (Anonymous, 2023-24) [2]. ~~In 2023-24, the global production of wheat was about 784.91 million metric tonnes and in India was about 112.74 million metric tonnes. Uttar Pradesh accounts for 33 million metric tonnes production followed by Madhya Pradesh (22.41 million metric tonnes) and Punjab (14.82 million metric tonnes). The Rabi crops data released recently by the Directorate of Economics and Statistics indicates that wheat harvest is expected to be slightly lower than the previous year, at 107-108 million metric tons. In 2023-24, food grain production is slightly lower at 328.8 million tonnes, primarily because of poor and delayed monsoons. (Economic Survey of India, 2023-24) [2].~~ Wheat is grown in a variety of soils of India. Soils with a clay loam or loam texture, good structure and moderate water holding capacity are ideal for wheat cultivation. Heavy soils with good drainage are suitable for wheat cultivation under dry conditions. These soils absorb and retain rain water well. Heavy soils with poor structure and poor drainage are not suitable as wheat is sensitive to water logging. Wheat can be successfully grown on lighter soils provided their water and nutrient holding capacity are improved. (

Write about selection of varieties and importance of sowing time)

Materials and Methods

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The experiment was laid out at Student's Instructional Farm of Chandra Shekhar Azad University of Agriculture and Technology, Kanpur (U.P.) India during *Rabi* season during 2022-23. The field was well levelled having assured irrigation and drainage facilities. Geographically, Kanpur is situated in subtropical region. It is situated at an elevation of 125.9 meter Above mean sea level, 26°39'35" North latitude and 80°18'25" East longitude. It is situated in the alluvial belt of Indo-gangetic plain in the central part of Uttar Pradesh, which comes into central plain zone. Normally, the climate of the area is semi-arid with hot summer, moderate rainfall and cold winter. The soil ~~texture may be~~ of the experimental ~~site~~ was sandy loam ~~in texture~~ having P^H 7.7, organic carbon 0.47%, available nitrogen 223 kg/ha, available P_2O_5 12.6 kg/ha and available K_2O 155 kg/ha. The factorial randomized block design (FRBD) was used in ~~conducting~~ experiment. Nine treatments combination comprised of three sowing dates *viz.* crop ~~Sown sown~~ on 23rd November (D1), 8th December (D2), and crop sown ~~on~~ 23rd December (D3) along with three varieties i.e. K-307, K-9107 and HD-2967 with three ~~Replication~~ ~~replications~~, plant spacing 22.5 cm row to row. An uniform ~~Recommended~~ ~~recommended~~ dose of ~~120-60~~ kg N, 60 kg P_2O_5 and 60 kg K_2O /ha was applied for wheat crop through urea, DAP and murate of potash as basal, respectively. Rest half dose of N (~~60 kg~~) was top dressed in two equal splits ~~doses~~ at tillering and panicle initiation stages. The other cultural practices were adopted as recommended for the success of crop. The crop was ~~irrigated four~~ ~~times~~ at critical stages ~~of crop growth~~. Ten plants were selected randomly in each plot and tagged for measuring height. Height was measured at different ~~critical~~ stages and at harvest stage with the help of ~~m~~ ~~eters~~ scale from ground surface to the tip of the uppermost leaf before emergence and up to the base of ear after emergence ~~the growth~~, yield attributes and ~~grain~~ yield were recorded for all ~~the~~ treatments at ~~time of harvest~~ ~~crop~~.

Result and discussion

Growth Attributes Crop growth

The results revealed that growth characters *viz.* initial plant population, plant height, number of tillers, dry matter accumulation of plant illustrates that growth of wheat varieties was significantly influenced by different dates of sowing and varieties. This may also be due to the congenial weather condition and best use of available soil moisture in maximum elongation period. The crop period due to first, second, and third date of sowing has been decreasing, respectively which makes it clear that 23rd November has enjoyed the maximum number of days for development of plants. 23rd November sowing ~~date~~ ~~crop~~ found

comparatively better in terms of increasing plant height (1.00%), number of tillers (2.22%) and dry matter accumulation (2.92%) over, compared to 23rd December sown cropping. The maximum growth rate of the plants under the 23rd November sowing might be due to plants getting more time for their growth and development compared to late sowing which has short growth and a short time period. Among varieties, HD 2967 exhibited Maximum maximum plant height (99.65 cm), number of tillers (387.88 m⁻²), dry matter accumulation (1113.01 g m⁻²) compared to K-307. The variety HD 2967 recorded an increase in terms of plant height (0.6%), number of tillers (0.7%), dry matter accumulation (2.5%) compared to the variety K-307. Probably because of the better genomics of the variety HD 2967, which excels in terms of growth and development, especially in particular climatic conditions compared to other varieties. These results are in conformity with the findings of Behera (1994), Kumar and Sharma (2003), Dhaka *et al.* (2007), Keim DC *et al.* (2004), Nainwal and Singh (2000), Musaddique *et al.* (2000), Anil Kumar Matta *et al.* (2011), Yusuf *et al.* (2019), Netam *et al.* (2020) and Mishra *et al.* (2003), Sanjay Chauhan *et al.* (2020), Mohammad Yusuf *et al.* (2019) and Matta *et al.* (2011).

Yield Attributes

The data pertaining to yield attributing character revealed that 23rd November sowing was found significantly better than 8th December and 23rd December sown crop. The mean longest length (11.34 cm) was found significantly of 23rd November sowing due to longer crop duration as compared to 8th December (9.81 cm) and 23rd December (9.66 cm). Among the varieties, HD 2967 had longer ears (10.78 cm) as compared to the other two varieties. The grain ear⁻¹ for the 23rd November sowing was found significantly higher in comparison to 8th December and 23rd December sowing. The maximum ear length (11.34 cm), grains ear⁻¹, grain weight ear⁻¹ and the test weight under 23rd November may be due to more synthesis of food material in timely sown. The highest grain ear⁻¹ was recorded under variety HD 2967 (44.20) in comparison to K-9107 and K-307. It might be due to the genetic character of variety HD 2967. The grain weight ear⁻¹ for the 23rd November sowing was found significantly higher in comparison to 8th December and 23rd December sowing. The maximum grain weight ear⁻¹ under the 23rd November may be due to the reason that no. of grains/ear were higher. The highest grain weight ear⁻¹ was recorded under variety HD-

2967(2.21g). Since number of grains ear⁻¹ were also higher in this variety, this must have contributed to more grain weight ear⁻¹. Test weight is a crucial wheat attribute that contributes to yield and is highly influenced by the genetic potential of a variety as well as the current growing environment. The test weight peaked in the crop sown on 23rd November (37.44 g) and declined with later sowing dates 8th December (37.22 g) and 23rd December (36.55). This could be because the grains were forced to mature and dry under later sowing conditions by a sudden increase in temperature and a strong wind. Variety HD 2967 (37.55 g) recorded the highest test weight than K 307 (37.22 g) and K 9107 (36.44g). It appears that HD 2967 superiority results from the effective translocation of metabolites towards grain development.

The increment recorded under different yield attributes varied to the tune in length of ear (14.92%), grain weight ear⁻¹ (20.35%), grains ear⁻¹ (11.44%) and test weight (2.37%), under 23rd November sowing compared to 23rd December sowing. The variety HD 2967 recorded better yield attributes varied to the tune in the length of the ear length (8.62%), grain weight ear⁻¹ (12.21%), grain ear⁻¹ (10.63%) and test weight (0.89%) compared to the variety K-307. Similar findings were also reported by Singh *et al.* (1994), Shirpurkar *et al.* (2007), Mumtaz *et al.* (2015), Ranu *et al.* (2018), M.A. Mumtaz *et al.* (2015), Jat *et al.* (2004), Dhaka *et al.* (2006) and Sanjay *et al.* (2020).

Yield

The data pertaining to the yield of wheat was significantly influenced by different dates of sowing and varieties. The biological yield of wheat increased 5.33% and 11.60% under 23rd November compared to 8th December and 23rd December sowing. Similarly, grain yield increased 20.16% in the 23rd November sowing compared to 23rd December sowing. The straw yield increased 7.08% under the 23rd November sowing compared to the 23rd December sowing.

The harvest index was also increased 10.03% under 23rd November compared to 23rd December sowing. Under different varieties HD 2967 produced maximum biological yield (3.79%), grain yield (4.01%), straw yield (4.24

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%), and harvest index (0.50%) compared to K-

307. It might be due to better genomic characters as well as better growth characteristics and yield attributes of the variety HD 2967 ~~achieved under favourable climatic conditions.~~

Similar findings were reported by ~~Singh et al. (1994), Thorat et al. (2000), Kumar et al. (2015),~~ M.A. ~~—————~~ Mumtaz ~~et al.~~

(2015), ~~Mishra et al. (2003), Jat and Singh (2004), Dhaka et al. (2006), Ranu et al. (2018)~~ and ~~Sanjay~~ Chauhan *et al.* (2020).

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Table 1: Effect of sowing dates and varieties on growth and yield of wheat during 2022-23

| Treatments | Growth Attributes characters | | | | Yield Attributes | | | | Yield | | | |
|---------------------------|------------------------------------|-------------------|---------------------------|--|--------------------|------------------------------------|--------------------------|-----------------|--|-------------------------------------|-------------------------------------|-------------------|
| | Plant population (m ²) | Plant height (cm) | Tillers (m ²) | Dry matter accumulation (gm ²) | Length of ear (cm) | Grain weight ear ⁻¹ (g) | Grains ear ⁻¹ | Test weight (g) | Biological yield (qkg ha ⁻¹) | Grain yield (qkg ha ⁻¹) | Straw yield (qkg ha ⁻¹) | Harvest index (%) |
| Date of sowing | | | | | | | | | | | | |
| 23 rd November | 120.47 | 99.47 | 390.33 | 1133.77 | 11.34 | 2.32 | 44.11 | 37.44 | 120.83 | 41.66 | 79.16 | 34.69 |
| 8 th December | 120.44 | 99.08 | 384.33 | 1117.70 | 9.81 | 2.02 | 41.55 | 37.22 | 114.50 | 36.34 | 78.15 | 31.81 |
| 23 rd December | 120.22 | 98.55 | 381.66 | 1100.6 | 9.66 | 1.85 | 39.06 | 36.55 | 106.92 | 33.26 | 73.55 | 31.21 |
| SE _d (D) | 0.29 | 0.32 | 1.728 | 1.381 | 0.103 | 0.03 | 0.550 | 0.345 | 0.659 | 0.381 | 1.129 | 0.410 |
| CD(P=0.05) | NS | 0.69 | 3.69 | 2.59 | 0.22 | 0.10 | 1.09 | NS | 1.41 | 0.81 | 2.41 | 0.87 |
| Varieties | | | | | | | | | | | | |
| K-307 | 120.05 | 98.21 | 385.33 | 1096.33 | 9.85 | 1.94 | 39.50 | 37.22 | 110.10 | 37.27 | 72.82 | 33.74 |
| K-9107 | 120.41 | 99.25 | 383.11 | 1142.82 | 10.17 | 2.04 | 41.03 | 36.44 | 117.71 | 35.26 | 82.00 | 30.06 |
| HD-2967 | 120.67 | 99.65 | 387.88 | 1113.01 | 10.78 | 2.21 | 44.20 | 37.55 | 114.44 | 38.83 | 76.05 | 33.89 |
| SE _d (V) | 0.29 | 0.32 | 1.728 | 1.381 | 0.103 | 0.03 | 0.550 | 0.345 | 0.659 | 0.381 | 1.129 | 0.410 |
| CD(P=0.05) | NS | 0.69 | 3.69 | 2.59 | 0.22 | 0.10 | 1.09 | NS | 1.41 | 0.81 | 2.41 | 0.87 |
| Interaction (D×V) | | | | | | | | | | | | |
| SE | 0.50 | 0.56 | 2.99 | 2.39 | 0.179 | 0.07 | 0.953 | 0.598 | 1.142 | 0.660 | 1.955 | 0.711 |
| CD(P=0.05) | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |

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Conclusion

This experiment concluded that the varieties HD-2967 was superior to K-307 and K-9107 from yield point of view and its attributes regarding selection of varieties under different dates tested in the study was also very clear that sequence of varieties in order of preference was HD-2967, K-9107, K-307. **(Conclusion not clear re-write it by mentioning the importance of both sowing dates and variety)**

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