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Performance of new wheat varieties at different dates of sowing under irrigated condition (*Triticum aestivum* L.)

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Abstract
The experimental study for the research name entitled ''Performance of new wheat varieties at different dates of sowing under irrigated conditions'' was carried out at Instructional Farm of Barrister Thakur Chhedilal College of Agriculture and Research Station, Sarkanda, Bilaspur during *Rabi* 2021-22. The design was split plot with three replications. The treatment comprised of two dates of sowing in main plot *viz*, D_1 (13thNovember) and D_2 (3rd December) with seven genotypes in subplot *viz* RCZTS 101, RCZTS 102, RCZTS 103, RCZTS 104, RCZTS 105, RCZTS 106 and RCZTS 107. 100 kilogram of seeds were used per hectare, spaced 20 cm between, to sow the crop. The experimental site had neutral soil (6.9), which had a clay loam texture. Potash (0.60 percent), low accessible nitrogen (138 kg ha^{-1}), medium phosphorus (12.8 kg ha^{-1}), and medium organic carbon (0.60 percent) were all present in the soil (186.14 kg ha^{-1}). For this experiment, a fertilizer dose of 120:60:40 NPK kg ha-1 was advised. The outcome demonstrated that plant population, growth parameters, including plant height, dry matter accumulation (g plant^{-1}), number of tillers, and yield attributes, including ear length (cm), weight of grain ear^{-1} head, number of grain ear^{-1} head, grain yield (q ha^{-1}), test weight (g), straw yield (q ha^{-1}), and harvest index (percent), were recorded maximum under the sowing date of 13th November (D_1) and minimum value was recorded under the sowing date of 3rd December (D_2).Among the genotypes, maximum growth and yield attributing parameters *viz*. number of tillers (m^{-2}), dry matter production (g plant^{-1}), grain yield and straw yield were recorded maximum in genotype (V_4) RCZTS 104 which was at par with (V_5) RCZTS 105 followed by (V_2) RCZTS 102, while the minimum was recorded in genotype (V_3) RCZTS 103.The genotype (V_4) RCZTS 104 recorded the highest B:C ratio (1.93), net return (58,175 ₹ ha^{-1}), and gross return (88,275 ₹ ha^{-1}), and while the genotype (V_3) RCZTS 103 recorded the lowest B:C ratio (1.45), net return (43,573 ₹ ha^{-1}) and gross return (73,673 ₹ ha^{-1}). Cost of cultivation was found same in all treatments.

Keywords: Wheat, varieties, yield

Introduction
Wheat (*Triticum aestivum* L.) is the most widely consumed staple. Wheat is a self-pollinating plant which belongs to poaceae family. With a global production of 792.40 million tonnes and a productivity of 3.52 t ha-1, wheat covers an area of 224.49 million hectares. In India, between 82 and 85% of crops are irrigated; the remaining are farmed using a rain-fed environment. The most significant staple food crop in the world, wheat (*Triticum aestivum* L.) emend. Fiori & Paol.] has emerged as the foundation of India's food security. Due to its wide range of adaptability and great nutritional value, it is grown all over the world. It is a significant winter cereal that contributes around 38% of India's total grain production. In India, a huge animal population relies heavily on wheat straw as food. In India, 109.52 million tonnes of wheat are produced annually, with a productivity of 3.81 tonnes per hectare in 2017–18. (Anonymous 2017-18). After China, India is the country with the second-highest production and consumption of wheat (12% of global production). With 1.05 million hectares of land under cultivation, 3.05 million tonnes of wheat produced, and an average yield of 2.89 tonnes per hectare in 2017–18. Wheat is a significant *Rabi* crop in Gujarat (Anonymous 2017-18). With a yield of 150,000 tonnes and an average productivity of 1340 kg ha-1, wheat is grown on around 112,000 hectares of land in Chhattisgarh. (Directors Report, 2020-21). Date of sowing is one of these environmental elements. The yield of the wheat crop is significantly impacted by this aspect. The growth, yield characteristics, grain and straw yields were all strongly influenced by the sowing timing.

The low average wheat yield in this tract is still the result of a variety of causes. Untimely planting is one of these environmental issues, and it significantly lowers the wheat crop production (Saini *et al*. 1988) [1]. In Chhattisgarh, almost 50% of the wheat is planted after the first week of December and suffers from heat stress, which drastically reduces production. Wheat that is planted too late experiences severe yield losses that might reach 40 to 50 percent. Heat stress has already been shown to have a substantial impact on lowering wheat production and quality. The timing of the sowing process has a big impact on yield characteristics, grain yield, and straw output. Apart from being controlled by genetic characteristics, the growth and development of wheat crops also heavily rely on a variety of environmental conditions that change depending on the planting date (Saini *et al*., 1988) [1]. One of the main causes of poor wheat development and productivity is the delayed sowing of crops that are exposed to both extremes of temperature, i.e. low temperatures during early growth periods that restrict vegetative phase and high temperatures during grain filling and ripening phases. Under field conditions, temperature cannot be easily changed, but seeding time can be changed so that the various physiological stages of the crop can satisfy their unique temperature requirements during cycles. By choosing appropriate cultivars, as the degree of yield decline varies with variety, the negative impact of delayed sowing can be reduced. To ensure maximum yield, it is essential to grow the right type at the right time. The selection of the right variety is crucial for obtaining the highest yield possible under ideal management and input circumstances. A suitable variety is necessary for the effective application of a suitable production technology. Time investment is a significant non-monetary input that has an impact on productivity. It is necessary to regulate the sowing period so that the crop thrives in the right climate and effectively uses the soil moisture stored in the profile for initial growth and development. Wheat crop growth, development, and yield are all impacted by sowing date variation. In addition to genetic traits, a number of environmental factors that vary depending on the planting date have a significant impact on the growth and development of wheat harvests (Saini *et al*., 1988) [1].

Hence, keeping this above facts in view an experiment was laid out to study:-

1. To evaluate the performance of new wheat varieties at different dates of sowing.
2. To identify the optimum sowing time for getting maximum yield.
3. To workout the economics under study.

Material and Methods

The experiment was carried out at the BTC College of Agriculture and Research Station's Research Farm in Bilaspur, Chhattisgarh, India, during the *Rabi* of 2021–2022. At an elevation of 292.3 m above mean sea level, Bilaspur can be found at latitudes 22 098" N and 82 15" E. The area belongs to India's Eastern Plateau and Hill Region (Agro-climatic zone 7). The state of Chhattisgarh is divided into three agro-climatic zones, including the Chhattisgarh Plains zone including Bilaspur. The experimental site is classified as sub humid with hot summers and cool winters and is located in the country's seventh agro-climatic zone, the Eastern Plateau and Hills. At the experimental site, annual rainfall averages 1503 mm (based on an 80-year mean), with the majority of the rainfall (85%) falling between June and September. Summertime temperatures range from 37.9 °C to 8.5 °C. The hottest and coldest months are May and December, respectively. The wheat field experiment was done in with two parameters, namely two sowing dates and seven genotypes, the experiment was set up as a split plot design and replicated three times. Recommended dose of fertilizer 120:60:40 N:P:K kg ha^{-1} was applied through urea, Single super phosphate and murate of potash respectively. All treatments applied a base dose of 50% nitrogen together with full doses of P and K at the time of sowing, and the remaining 50% nitrogen was applied in two equal splits, with 1/4 applied after first irrigation (CRI) and the second dose applied right before ear emergence. Irrigation was originally used shortly after seeding in order to encourage robust germination throughout the crop season. At critical junctures in the crop's growth, subsequent irrigation was supplied as needed. As a result, the flood irrigation method was used to irrigate the wheat crop a total of five times. Initially, irrigation was used soon after seeding to promote strong germination all through the agricultural season. The crop received additional irrigation as necessary at pivotal points in its growth. As a result, the wheat crop was irrigated using the flood irrigation technique a total of five times. After harvest, bundles were transferred from the field to the threshing floor where they were sun dried for four days. After the bundle had dried in the sun, it was weighed. Bundle weighing was followed by independent threshing using a thresher in multiple conditions. The weight of the grain was measured after cleaning. The weight of the grain was then subtracted from the weight of the bundle to get the weight of the straw.

Results and Discussion

The outcome demonstrated that plant population, growth parameters, including plant height, number of tillers, and yield attributes, including grain yield (q ha^{-1}), test weight (g), straw yield (q ha^{-1}) were recorded maximum under the sowing date of 13th November (D_1) and minimum value was recorded under the sowing date of 3rd December (D_2). Among the genotypes, maximum growth and yield attributing parameters *viz*. number of tillers (m^{-2}), dry matter production (g $plant^{-1}$), grain yield and straw yield were recorded maximum in genotype (V_4) RCZTS 104 which was at par with (V_5) RCZTS 105 followed by (V_2) RCZTS 102, while the minimum was recorded in genotype (V_3) RCZTS 103.The genotype (V_4) RCZTS 104 recorded the highest B:C ratio (1.93), net return (58,175 ₹ ha^{-1}), and gross return (88,275 ₹ ha^{-1}), and while the genotype (V_3) RCZTS 103 recorded the lowest B:C ratio (1.45), net return (43,573 ₹ ha^{-1}) and gross return (73,673 ₹ ha^{-1}). Cost of cultivation was found same in all treatments. Reduced cell growth also has a major impact on the meristematic development of yield-related components, such as the development of wheat's inflorescence or tiller initiations, which may result in undersized reproductive organs and decreased production. Due to the shortened growing period, there were fewer grains in ear-1 as compared to early sowing. These results are in line with those of Poonam and Uma (2015) [3].

Pathania *et al.* (2018) [2] the results reveal that the wheat sown on 20th November produced the maximum plant height, tillers per square meter, dry matter accumulation, grains per spike, and grain and straw yield. Among the

cultivars, VL-907 demonstrated significantly higher grain yield in terms of grains/spike, grains, and straw.

Table 1: No. of tiller m^{-2} at successive stages of wheat as influenced by different irrigation levels and genotypes.

Treatments	Plant height (cm)	No of tillers (m^{-2})
A. Sowing dates		
D1 (13th November)	94.12	379.50
D2 (3rd December)	91.37	373.36
S.E.M ±	0.18	0.67
B. Genotypes		
RCZRI 301	91.14	372.38
RCZRI 302	93.18	383.10
RCZRI 303	89.27	364.75
RCZRI 304	96.95	388.17
RCZRI 305	95.33	382.92
RCZRI 306	92.86	379.25
RCZRI 307	90.50	364.41
S.E.M ±	1.35	2.73
C.D.(P=0.05)	3.94	7.98

Table 2: Test weight, grain yield and straw yield of wheat as influenced by different irrigation levels and genotypes.

Treatments	1000 seed weight	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})
A. Sowing dates			
D1 (13th November)	43.21	44.71	46.37
D2 (3rd December)	40.86	37.35	44.23
S.E.M ±	0.18	1.03	0.32
C.D.(P=0.05)	0.12	6.29	1.97
B. Genotypes			
RCZRI 301	41.61	39.40	43.65
RCZRI 302	42.38	42.90	46.95
RCZRI 303	41.33	37.27	43.36
RCZRI 304	43.09	44.66	47.91
RCZRI 305	42.63	43.24	46.69
RCZRI 306	41.95	41.30	45.58
RCZRI 307	41.26	38.47	42.94
S.E.M ±	0.42	0.78	1.20
C.D.(P=0.05)	1.25	2.28	3.21

Conclusion

It is concluded from the study that 13th November is the best sowing time for wheat crop for getting higher yields and economic returns. Amongst the genotypes, (V_4) RCZTS 104 was found superior in crop growth parameters, yields and economic returns followed by (V_5) RCZTS 105 and (V_2) RCZTS 102 respectively. Maximum gross, net return and B:C ratio was recorded under D_1 (date of sowing) and were also found under (V_4) RCZTS 104 genotype.

Suggestions for future work

The experiment needs to be repeated in the same season to get more assurance. Sowing time is the most important factor for crop growing, hence for obtaining higher yield crop should be grown on time i.e., timely sown crop gives better yield than late sown crop. RCZTS 104 (V_4) performed best among all the genotypes, so this variety can be grown for obtaining better results.

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