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To study about performance of wheat crop grown under variable weather conditions

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Abstract
A field experiment was conducted to study about performance of wheat crop grown under variable weather conditions (*Triticum aestivum* L) in the year 2020-21. The experiment was comprised of three different dates of sowing *viz.* (15th Nov., 25th Nov. and 5th Dec.) and three varieties (*viz.* NW- 5054, DBW-252 and HD-2967). The results revealed that various date of sowing / weather variability and varieties of wheat significantly affected the number of tillers m^{-2} at all the stages of crop growth except 15 and 30 DAS. Higher number of tillers $m^{-2}$was recorded with 15th Nov. date of sowing which was at par with 25th Nov date of sowing while significantly superior over 05th Dec. date of sowing at all the stage of crop growth. In case of varieties the higher number of tillers m^{-2} was recorded with variety NW-5054 which was at par with DBW-252 while significantly superior over HD- 2967 at all the stages of crop growth. The results revealed that Grain yield of wheat was significantly affected by different date of sowing / weather variability and varieties of wheat. As regard date of sowing / weather variability, higher grains yield was recorded with 15th Nov. date of sowing which was at par with 25thNov date of sowing while significantly superior over 05th Dec weather variability. In case of varieties the, higher grain yield was recorded with variety NW-5054 which was at par with DBW-252 and significantly superior over HD-2967 variety.

Keywords: Weather variability, date of sowing, no. of tillers, variety, crop yield etc

Introduction
Wheat (*Triticum aestivum* L) is the most extensively cultivated food grain crop of the world. In In- dia, it is the second important staple food crop, after rice (Agrawal and Sinha, 1993). Wheat is a long day plant. The perfect temperature for seed sowing and germination ranges between 20 ºC to 25 ºC whereas the optimum temperature for vegetative growth ranges from 16 to 22 ºC. Through the grain development, wheat requires a mean maximum temperature of nearly 25 ºC for at least 4 to 5 weeks. Wheat is grown well in such areas where annual rainfall ranges from 1200 mm to 1600 mm. Winter wheat normally completes its life cycle hastily when grown in low temperatures during the early stages of growth but high temperature is required during later stages of growth (Bobade, 2010) [2]. Wheat production is well affected by climate change by increasing both abiotic stresses (cold, drought, heat, salinity, and water logging) and biotic stresses (destructive diseases and insect pests). Over the past few decades, climate trends have get rapid attention by researchers in many agricultural regions around the world, and the rise in atmospheric carbon dioxide (CO^2) and ozone (O_3) levels have also been universal (David and Sharon, 2012) [3]. Climate change is also affecting wheat quality as rising in CO_2 may negatively influence protein quality and content and increasing temperatures can negatively influence grain size (Tadesse *et al.*, 2016). Rising atmospheric CO^2 concentrations pro- vide some counteracting tendencies to the otherwise negative impacts of increasing temperature and reduced soil moisture (David and Sharon, 2012) [3].
Wheat is the second most main food crop of India and occupies nearly 29.9 million hectares of land (Sharma *et al.* 2020) [4]. In India, wheat is grown in all the states in the North and Central regions. It is generally sown from October to December and harvested from February to May. It is grown in an area of 29.9 million hectares with an average productivity of 3,418 kg/ha. (Sharma *et al.* 2020) [4]. Its involvement is approximately 25% of the total food grain creation of the country. Uttar Pradesh ranks first in area (9.54 million hectare) and production (32.74 million tons) while Punjab ranks first in productivity (Sharma *et al.* 2020) [4].

Material and Method

The present entitled **"**To study about performance of wheat crop grown under variable weather conditions (*Triticum aestivum* L)" was carried out during *rabi* season of 2020-21. The experiment was conducted at Agromet. Research Farm, Acharya Narendra Deva University of Agriculture and Technology Kumarganj Ayodhya (U.P.), which is geographically situated between 26°.47 N latitude to 82°.12 E longitude and at an altitude of 113 m above mean sea level. The climate of district Ayodhya is semi-arid with hot summer and cold winter. The site is located in typical saline-alkali belt of Indo- Gangetic alluvium of eastern Uttar Pradesh. Geographically, Ayodhya falls under semi-arid and sub-tropical climate of Indo Gangatic plains having alluvial calcareous soil. The average annual precipitation is about 1001 mm of which 85-90 per cent received during monsoon period *i.e.* between June to September. The temperature reaches to its peak (40-45 °C) during May while the temperature is quite low during December and January. The experiment was conducted out in split plot design with three dates of sowing (15th Nov 2020, 25th Nov 2020 and 05th Dec 2020) and three varieties (NW- 5054, DBW-252 and HD-2967) with four replications. The experimental field was divided into 36 plots.

Result and Discussion

The plant population $m^{-2}$of wheat was not influenced significantly by weather variability / dates of sowing and various varieties. This might because, germination totally depends on soil temperature and soil moisture, which were the same in all the dates of sowing, and hence indicated the uniform viability of all the varieties of wheat. It is clear from the data given in table-1 that various date of sowing / weather variability and varieties of wheat significantly affected the number of tillers m^{-2} at all the stages of crop growth except 15 and 30 DAS. It is clear from the data given in table-2 that higher number of tillers $m^{-2}$was recorded with 15th Nov. date of sowing which was at par with 25th Nov date of sowing while significantly superior over 05th Dec. date of sowing at all the stage of crop growth. In case of varieties the higher number of tillers m^{-2} was recorded with variety NW-5054 which was at par with DBW-252 while significantly superior over HD-2967 at all the stages of crop growth. Higher number of tillers m^{-2} was recorded with 15th Nov. date of sowing which was at par with 25th Nov date of sowing. It is clear from the data given in table-3 that regards date of sowing / weather variability, higher number of effective tillers m^{-2} was recorded with 15th Nov. date of sowing which was at par with 25th Nov date of sowing while significantly superior over 05th Dec. date of sowing. In case of varieties the higher number of effective tillers m^{-2} was recorded with variety NW- 5054 which was at par with DBW-252 while significantly superior over HD-2967 variety. Significantly higher length of ear was recorded with 15th Nov date of sowing which was at par with 25th Nov. while significant over 5th Dec. weather variability. Higher number of grains ear^{-1} was recorded with 15th Nov. date of sowing and lowest number of grains ear^{-1} was recorded with 05th Dec. date of sowing. It is evident from the data given in table-4 that Grain yield of wheat was significantly affect- ed by different date of sowing / weather variability and varieties of wheat. As regard date of sowing / weather variability, higher grains yield was recorded with 15th Nov. date of sowing which was at par with 25thNov date of sowing while significantly superior over 05th Dec weather variability. In case of varieties the, higher grain yield was recorded with variety NW-5054 which was at par with DBW-252 and significantly superior over HD-2967 variety.

Table 1: Effect of weather variability/date of sowing and varieties on plant population (m^{-2}) of wheat

Treatments	Plant population(m^2)
Date of sowing / Weather variability	
15 Nov	49.0
25 Nov	48.3
05 Dec	49.0
SEm±	1.24
CD (P=0.05)	NS
Varieties	
NW-5054	49.6
DBW-252	48.0
HD-2967	48.6
SEm±	0.97
CD (P=0.05)	NS

Table 2: Number of tillers (m^{-2}) at various growth stages of the wheat crops affected by Different treatments

Treatments	Number of tillers (m^{-2})						
	15 DAS	30 DAS	45 DAS	60 DAS	75 DAS	90 DAS	105 DAS
Date of sowing / Weather variability							
15 Nov	148.6	185.8	204.8	307.3	327.9	334.6	341.4
25 Nov	146.3	182.9	203.1	304.6	325.0	331.7	338.5
05 Dec	142.3	177.9	188.3	282.5	301.4	307.6	313.9
SEm±	2.66	4.43	3.91	5.37	6.15	5.51	59.1
CD (P=0.05)	NS	NS	13.53	18.60	21.28	19.09	20.45
Varieties							
NW-5054	147.3	184.1	207.9	311.9	332.9	339.7	346.6
DBW-252	145.6	182.0	198.6	298.0	318.0	324.4	331.1
HD-2967	144.3	180.4	189.6	284.5	303.6	309.8	316.1
SEm±	2.55	3.51	3.61	5.28	6.09	5.39	5.71
CD (P=0.05)	NS	NS	10.72	15.69	18.09	16.01	16.98

Table 3: Yield attributing characters of wheat crop as affect by different treatment

Treatments	Number of effective tillers (m^{-2})	Length of ear (cm)	Number of grainsear^{-1}	Test weight (g)
Date of sowing / Weather variability				
5 Nov	331.5	11.1	39.8	39.0
25 Nov	328.6	10.8	39.0	39.0
05 Dec	304.7	10.4	38.2	38.9
SEm±	5.68	0.12	0.15	1.12
CD (P=0.05)	19.68	0.41	0.51	NS
Varieties				
NW-5054	336.5	11.0	39.2	39.1
DBW-252	321.4	10.7	39.0	39.0
HD-2967	306.9	10.6	38.9	38.8
SEm±	5.64	0.10	0.17	0.74
CD (P=0.05)	16.76	0.29	0.50	NS

Table 4: Yield of wheat crops as affected by different treatments

Treatments	Grain yield (qha-1)	Straw yield (q ha-1)	Biological yield (q ha-1)	Harvest Index (%)
Date of sowing / Weather variability				
15 Nov	51.6	75.2	126.8	40.6
25 Nov	50.0	73.1	123.1	40.6
05 Dec	45.4	66.4	111.8	40.5
SEm±	1.30	1.79	2.97	1.17
CD (P=0.05)	4.51	6.19	10.29	NS
Varieties				
NW-5054	51.6	75.4	127.1	40.6
DBW-252	48.9	71.4	120.4	40.6
HD-2967	46.4	67.9	114.3	40.6
SEm±	0.93	1.44	2.41	0.77
CD (P=0.05)	2.79	4.28	7.18	NS

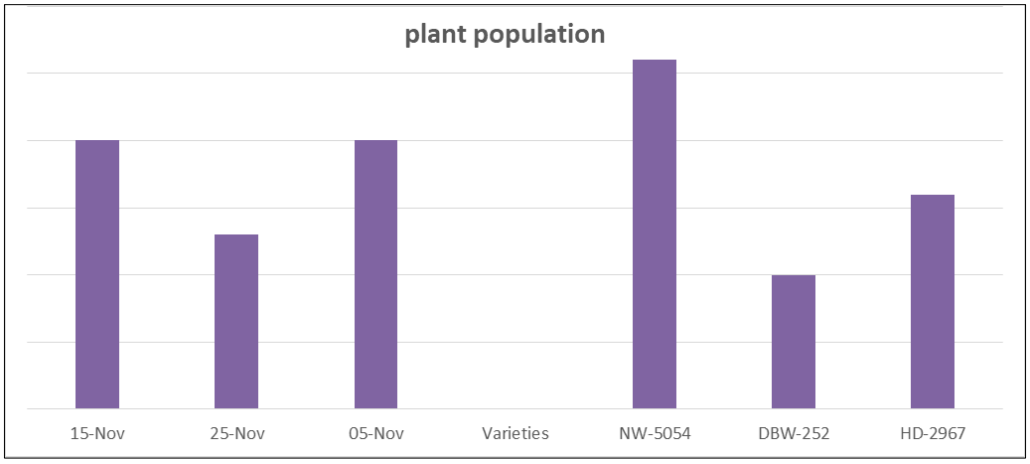

Fig 1: Effect of weather variability/date of sowing and varieties on plant population (m^{-2}) of wheat

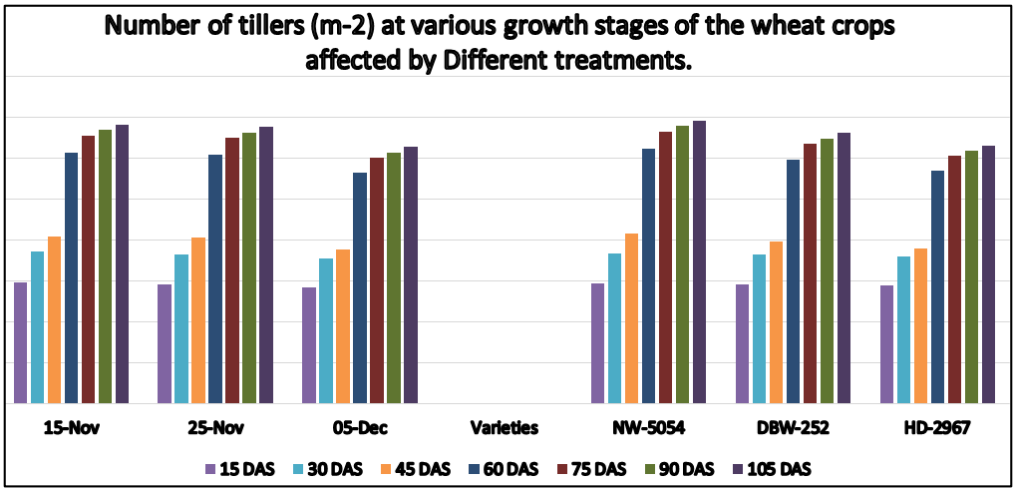

Fig 2: Number of tillers (m^{-2}) at various growth stages of the wheat crops affected by Different treatments

Conclusion

It is revealed that the plant population $m^{-2}$of wheat was not influenced significantly by weather variability / dates of sowing and various varieties. Higher number of tillers $m^{-2}$was recorded with 15th Nov. date of sowing which was at par with 25th Nov date of sowing while significantly superior over 05th Dec. date of sowing at all the stage of crop growth. In case of varieties the higher number of tillers m^{-2} was recorded with variety NW-5054 which was at par with DBW-252 while significantly superior over HD-2967 at all the stages of crop growth. As regards date of sowing / weather variability, higher number of effective tillers m^{-2} was recorded with 15th Nov. date of sowing. In case of varieties the higher number of effective tillers m^{-2} was recorded with variety NW-5054 which was at par with DBW-252 while significantly superior over HD-2967 variety. Length of ear of wheat was influenced significantly by various date of sowing / weather variability and varieties of wheat. Significantly higher length of ear was recorded with 15th Nov date of sowing which was at par with 25th Nov. while significant over 5th Dec. weather variability. The number of grains ear^{-1} of wheat was influenced significantly by various date of sowing / weather variability and varieties of wheat. The test weight of grains of wheat was not influenced significantly by various date of sowing / weather variability and varieties of wheat. As regard date of sowing / weather variability, higher grains yield was recorded with 15th Nov. date of sowing which was at par with 25thNov date of sowing while significantly superior over 05th Dec weather variability. In case of varieties the, higher grain yield was recorded with variety NW-5054 which was at par with DBW-252 and significantly superior over HD-2967 variety.

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