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Response of yield and associated traits of wheat genotypes to temperature fluctuations at Dera Ismail Khan

[a] Muhammad Rizwan Jamil Khan, [b] Ayesha Hassan*, [c] Mustansar Aslam, [d] Muhammad Mohibullah Khan, [e] Kalim Ullah, [d] Laraib Ali

[a] University of Central Punjab Okara Campus, Punjab, Pakistan,
[b] Energy, Environment and Society, School of Humanities, Social Sciences and Law, University of Dundee, United Kingdom,
[c] Department of Plant Pathology, University of Agriculture, Faisalabad, Pakistan,
[d] Department of Plant Breeding and Genetics, Faculty of Agriculture, Gomal University, D. I. khan, Pakistan,
[e] Cytogenetics Section, Central Cotton Research Institute, Multan, Pakistan.

Contribution Khan, M. R. J., A. Hassan, M. Aslam, M. M. Khan, K. Ullah &. L. A. Akthar conducted the experiments, collected and analysed the data, critically reviewed and corrected the manuscript.

ABSTRACT

Wheat is the third largest staple food crop accounting for approximately 4% of cropland and its demand is continuously increasing to feed the growing world population. Average surface temperature and recurrent heat waves are continuously rising from last few decades that adversely influence yield potential of various crops including wheat. Temperature differences can be fashioned by cultivating at diverse planting times. Aim of current investigation was to appraise impact of planting times and thermal high temperature (growing degree days) on yield of 8 cultivars. Crop was exposed to four planting times in wheat crop season 2022-23. Experiment was carried out in randomized complete block (RCB) design with 3 replications. Results revealed that planting times depicted significant variances for all considered yield and associated traits. Similarly, cultivars too exhibited highly significant differences for plant height, physiological maturity, spike length, spikelets/spike, grains/spike, thousand grain weight and grain yield/plant however 50% days to heading and tillers per plant depicted non-significant differences among genotypes. Interaction of planting time to genotypes was also significant for 50% days to heading, days to physiological maturity, spike length, spikelets/spike, grains/spike and 1000 grain weight however it was non-significant for plant height, tillers/plant and grain yield per plant. Cultivar AZRC-Dera produced highest grain yield/plant on account of maximum spikelets, grains spike^{-1}, tillers and thousand grain weight. Highest grain yield was recorded in planting times from 1st November to 20th November due to accumulation of more heat units whereas late cultivation reduced production on account of less accumulation of heat units. Therefore it is determined that wheat should be planted from 1st November to 20th November in Dera Ismail Khan to have good harvest.

Keywords: *T .astivum,* Planting times, growing degree days, genotypes, production.

INTRODUCTION: After maize and rice, wheat is the third-largest crop in world in terms of area, accounting for approximately 4 percent of all cropland on the planet. With an increasing global population and changing consumer tastes and preferences, the demand for wheat has increased significantly over the past 50 years. As a general rule, abiotic factors, such as high temperatures (20%), low temperatures (7%), saltiness (9%), drought (9%) and other types of stress (4%) are to blame for agricultural crop yield losses around the world. India and Pakistan among the countries of Southeast Asia are especially challenged by a variety of diverse abiotic stresses that are combined in a variety of ways (Sharma and Kiran, 2013). These countries are having more droughts, floods, land degradation, temperature changes and other problems that are hurting their production. Pakistan produced 28.16 M ton of wheat from an area of 9.03 M ha with average production of 3.12 t ha^{-1}. Wheat production is primarily influenced by biotic and abiotic factors across the globe. Biotrophic fungus, necrophyte species and nematodes, as well as viruses and bacteria damage the wheat crop. Temperature, inoculum levels and susceptible cultivars have all influenced the disease's effect on farmed cereals throughout time. Wheat is a winter cereal crop which needs particular environment for better growth and development. It is cultivated in a variety of environments on account of its ability to resist low temperatures. However it is susceptible when exposed to temperature fluctuations during their reproductive stages (Kalra *et al.*, 2008). Winter wheat phenology is associated with various environmental factors among which temperature is the most prominent (McMaster *et al.*, 2012). Amongst different reasons accountable for less produce, the potential of genotypes, impact of weather variables and their proper planting time is of utmost importance (Tahir *et al.*, 2009). The previous research depicted that every single day delayed sowing after optimum planting time (20th November) might reduce the grain yield up to 40 kg ha^{-1} day^{-1}. Similarly early planting results in poor development of root system on account of more temperature while late planting results in poor tillers development. Each cultivar has a particular genetic base and their expression at phenotype level depends upon the environment in which it is cultivated and sown. Moreover these genotypes when grown under the diverse environments and are exposed to various weather variables like moisture, temperature, photoperiod, day length, sunshine, rainfall and other abiotic stresses, they perform differently for different variables. As these weather variables are uncontrolled and it's very difficult to modify these variables (Gul *et al.*, 2014), therefore awareness and knowledge of its impact on the crop performance is of utmost and more importance in comparison to controlled factors. One of the ways to investigate the impact of these uncontrolled factors is to evaluate and repeat the experiment at various planting times so as to develop variations in temperature and other weather variables for growth, development and maturity on account of the reason that these weather attributes influences contrarily crop growth and development, thus providing extensive choice of weather variables from growing till maturity (Gul *et al.*, 2016). The expression of a particular genotype in different environments is called as the genotype by environment interaction. This interaction is of utmost importance for the genotypes estimation because of the reason that various genotypes might reduce its genetic firmness in various environments (Qasim *et al.*, 2008). As the farmers always need consistent yield and quantity, therefore it is crucial to assess and establish certain genotype at various environments so as to fulfil the needs of the farmers (Gauch and Hugh, 2006). Thus it is one of the most significant features of the breeding programs along with introduction of superior wheat cultivars as yield durability analysis (Neacșu, 2011). Temperature is the major force for the growth and development of any crop and different phenological phases are exhibited during its development. Phenology is elaborated as the alterations which persist from germination till harvesting and their association with the climatic conditions in which it is grown. It is the main component in crop adaptation in certain environment and its duration and length are the vital determinants of grain yield. The start and end of these phenological phases are excellent pointers of potential crop growth (Calvino *et al.*, 2003). Previous research findings suggested that growing degree days and thermal time differs from genotype to genotype regarding various phenological stages of growth and development (LI *et al.*, 2012). However the previous research depicted that base temperature other than 0 has also been calculated and reported for various phenological phases of the wheat crop. Moreover it was concluded that with the increase in age of the crop, the base temperature also increases.

OBJECTIVES: In this context the objectives of the present investigation were to scrutinize influence of sowing times on productivity of wheat and to associate and develop a model between the heat unit accumulation and yield associated characters of wheat cultivars sown at various times.

MATERIALS AND METHODS: The investigational material containing of 8 commercial wheat cultivars were acquired from

National Agriculture Research Council (NARC), Islamabad, were cultivated in the experimental area of Gomal University, Dera Ismail Khan at 4 various planting times so as to develop variation in temperature for growing, developing and maturity of crop. Climatological data was collected from Arid Zone Research Centre (AZRC), D.I Khan. Scheduled maximum, minimum and average temperature and precipitation throughout the study duration were calculated. Base temperature for growing degree days (GDD) estimation in wheat is commonly 0º C. Cumulative heat units (CHU) for different phases were intended by equation (Dwyer and Stewart, 1986).

$$CHU = (Tmax + Tmin)/2 - Tb$$

Where, Tmax, Tmin and Tb are maximum, minimum and base temperature correspondingly.

Experimental environments: The experiment was conducted involving four planting dates for the year 2022 (table 1).

Environment	Crop period	Sowing time
E1	2022	1st November
E2	2022	20th November
E3	2022	10th December
E4	2022	30th December

Table 1: The four deployed environments used in study were as follows.

Eight wheat varieties (Persabak-2015, Paseena-2017, Khaista-2917, Wadan-2017, Shahid-2017, Israr-shaheed-2017, Persabak-2019 and AZRC-DERA) were examined at four dissimilar times of planting for the year 2022. Varieties were cultivated in RCB fashion with 3 repetitions. Sowing was performed in 3 row plot of 3 m long at space of 0.30 m among and 0.10 m in hills. Every hill was placed with 5 seeds that were later on thinned to single plant after three weeks of germination. Fertilizer at the rate of 60 kg/ha of P_2O_5 as SSP and 60 kg/ha of N as urea were smeared before planting and another 60 kg/ha N as urea smeared at anthesis and grain filling duration phase. All the cultural operations were performed as per endorsements. Data was recorded for days to plant height (from base to tip of spike excluding awns in cm), 50% heading (from sowing to 50% heading stage), days to physiological maturity (from sowing to the stage when the crop turned yellow), number of tillers plant^{-1}, spike length (cm), number of spikelets spike^{-1}, and number of grains spike^{-1}, 1000-grain weight and grain yield plant^{-1}. For this purpose, 5 plants were randomly selected, data was recorded accordingly and then averaged. Data recorded for the above mentioned parameters, was exposed to ANOVA as recommended by Steel and Torrie (1960). Combined ANOVA was carried out after homogeneity test for error variance through Bartlett's tests (Snedecor and Cochran, 1983). To conclude statistical alterations in averages, LSD test was used. .

RESULTS AND DISCUSSION: Combined ANOVA of yield and associated traits: ANOVA of grain yield and associated traits depicted high substantial ($P \le 0.01$) variances in planting times for the studied attributes (table 2) depicting the existence of variability in the planting environments. Similarly the genotypes also exhibited highly significant differences for plant height, days to physiological maturity, spike length, spikelets spike^{-1}, while days to heading, tillers plant^{-1} depicted non-significant difference for the genotypes showing considerable genetic variability among the genotypes. This explains that the genotypes also have remarkable differences with respect to plant height, physiological maturity duration, spike length, spikelets spike^{-1}, grains, grain weight and ultimately the grain yield. It further elaborated that some of the genotypes were better and taller than the others and some are early maturing in comparison to others. The interaction of planting time and genotypes was also significant ($P \le 0.01$) for days to heading, days to maturity, spike length, spikelets spike^{-1}, grains spike^{-1} and 1000-grain weight which reflects the wider variability of genotypes for maturity, grain filling duration and these yield related traits in different planting environments and understanding that these genotypes are remarkably interacted with environment for their maturity, grain filling duration and yield related attributes. These consequences are in line with previous outcomes of Haq *et al.* (2017) who also detected genetic diversity and interaction of various genotypes with environment. The previous results of Sattar *et al.* (2023) also support the present findings. These consequences are also in agreement with previous conclusions of Mahdavi *et al.* (2022) and who perceived genetic diversity and interaction of various genotypes with environment. The previous results of Yadav *et al.* (2023) also support the present findings.

Wheat development and phenology: Heat units accumulated during the crop life cycle provides more reliable and precise physiological measures in comparison to the counting of the calendar days. Knowing the base temperature for each phenological phase of crop of cultivar can be beneficial the growth and development of commonly utilized wheat simulation models. The environmental attributes especially the environment is the key component which influences the crop growth, development and phenology.

S.O.V	DF	Plant height (cm)	Days to heading	Days to maturity	Tillers plant^{-1}	Spike length (cm)	Spikelets/spike	Grains spike^{-1}	1000 grain weight	Grain yield/plant
Replications	2	60.602	3.219	0.376	10679	0.06285	0.3927	1.9384	2.1518	1.0527
Planting time (T)	3	391.996**	658.607**	623.668**	12.8328**	5.65427**	8.6458**	97.4342**	84.7691**	26.8555**
Genotypes (G)	7	71.759**	2.589	11.349**	1.7367	0.68905**	21.9730**	50.9965**	65.6318**	28.6840**
T × G	21	5.052	4.555**	3.659*	1.4718	0.28113*	0.0875**	1.0890**	0.9769**	0.0829
Error	62	3.077	1.203	1.727	1.3783	0.11614	0.0270	0.4125	0.2764	0.0744
CV%	-	1.82	0.90	0.81	11.77	2.99	0.91	1.19	1.43	1.17

Table 2: F-values of ANOVA and coefficient of variation (CV) values for the Impact of foliar application of MLE on quinoa genotypes under salt stress.

*, ** significant at 5% and 1% probability correspondingly.

Significant variances for cumulative heat units and growing degree days were depicted in the present study (table 3) which reflected that the studied genotypes are different regarding their maturity duration as a consequence of various growing degree days and heat unit accumulation. The maximum growing degree days of 1639.54 were recorded in the crop grown on 20th November on account of accumulating maximum heat units which reflects that this is the optimum planting time for wheat to harvest better produce. This was followed by the 1st November planting which exhibited 1587. 23 growing degree days while minimum growing degree days was recorded in the late planted crop of 30th December. Wheat genotypes performed differently at different planting times which might be attributed to the difference in accumulation of different heat units (Salazar-Gutierrez, 2013), temperature differences, and high temperature during their reproductive phases (Kalra *et al.*, 2008). Findings of Haq *et al.* (2017) also authenticated these outcomes which stated that variances in planting times may be because of differences in genetic make-up of genotypes and their dealings with the atmospheres. As planting is the major agronomic feature and to find out the optimal time of planting and appropriate genotype for a particular area is of utmost importance to harvest maximum yield. The yielding potential and their ability to express this potential of the mentioned wheat genotypes was the result of the interaction of these genotypes with the planting time. Maximum planting time variances for grain yield was observed in various planting conditions/environments. Both cultivars and planting time subsidized to these variances, though, environmental complex depicted the yield impacts (Yadav *et al.*, 2023). Like the above mentioned studies, cultivars and atmospheres were the principal factors for variances in yield in the present study also.

Planting time	Growing degree days	Grain yield/plant
1st November	1587.23	23.93 b
20th November	1639.54	24.37 a
10th December	1468.12	23.01 c
30th December	1285.41	21.98 d
$LSD_{0.05}$	-	0.157

Table 3: Association amongst growing degree days and grain yield/plant.

Plant height (cm): The combined analysis of variance depicted that plant height was significantly different in different genotypes and planting times while the interaction of genotypes to planting times was non-significant. For plant height, the genotype means ranged from 94.08 to 101.67 cm while for the planting time it ranged from 90.375 to 99.167 cm (Figure 1a, b). In the genotypes the Khaista-17 depicted minimum plant height which was statistically similar to those of Wadan-17, Shahid-17 and Paseena-17. Maximum plant height was recorded for the genotype AZRC-Dera (101.67 cm) followed by Persabak-19 and persabak-15. These consequences are at par with previous results of Haq *et al.* (2017) who also recorded substantial differences for plant height in cultivar and planting times. They reported that late planting resulted reduction in plant height on account of the reason that the vegetative phase of the plant squeezed and plant not attained the desired height.

Days to 50% heading: ANOVA reflected significant variances in planting times while the genotypes were non-significantly different whereas the interaction of genotypes to planting times was also significant. For days to heading, the planting times mean values ranged from 115.50 to 126.71 days (figure 1e). Maximum days to heading of 126.71 days were taken when the planting was performed on 1st November which was at par with the 20th November. Whereas more postponement in sowing abridged days to heading and thus 115.50 days was documented in plants sown on 30th December. For days to heading the genotypes was non-significantly different from one another. In the genotypes x planting time interaction means, minimum and equal days to heading were taken by genotype AZRC-Dera, persabak-19, Israr-shaheed-17 and Shahid-17 under late planting environment. Maximum days to heading were observed in AZRC-Dera which was statistically at par with Shahid-17 in early planting of 1st November and 20th November respectively. The present outcomes are in confirmation with verdicts of Yadav *et al.* (2023) who observed similar varying trend of days to heading in genotypes which might be due to similar agro-climatic conditions of the region where they investigated. Postponement in planting time caused decrease in days to heading. Previously, Hamam and Khaled (2009) also mentioned that delay in planting reduces the days to heading.

Days to physiological maturity: The average data of days to physiological maturity reflected significant variances in planting times, cultivars and interaction of genotypes to planting times. For days to physiological maturity, the planting times mean values ranged from 156.17 to 167.40 days (figure 1c). Maximum days to physiological maturity of 167.40 days were taken when the planting was performed on 1st November followed by the 20th November. While further delay in planting reduced the days to physiological maturity and thus 156.17 days was noted in plants sown on 30th December. For days to maturity the genotypes fluctuated from 161.42 to 163.92 days (figure 1d). Maximum days to physiological maturity were recorded in Paseena-17 which was statistically at par with wadan-17, Israr-shaheed-17, Khaista-17 and persabak-15 while minimum days to physiological maturity were recorded in persabak-19. In the genotypes x planting time interaction means, minimum and equal days to physiological maturity were taken by genotype AZRC-Dera, persabak-19, Israr-shaheed-17 and Shahid-17 under late planting environment. Maximum days to physiological maturity were observed in AZRC-Dera which was statistically at par with Israr-shaheed-17, persabak-15 in early planting of 1st November and optimum planting of 20th November respectively. These consequences are in confirmation with outcomes of Yadav *et al.* (2023) as they also observed similar varying trend of days to maturity in cultivars. Delay in planting time resulted in reduction in days to physiological maturity. Previously, Hamam and Khaled (2009) also mentioned that delay in planting reduces the days to maturity.

No. of tillers per plant: Mean values relating to tiller per plant depicted that tillers was meaningfully different in different planting times while the genotypes and interaction of genotypes to planting times was non-significant. For tillers per plant, the planting time means ranged from 8.98 to 10.69 while for the genotypes it ranged from 9.50 to 10.53 (figure 1g & h). In the planting time highest tiller per plant (10.69) was noted in optimum planting of 20th November that was at par with early planting of 1st November whereas minimum tillers per plant was noted in the delayed planting of 30th December. These consequences are at par with previous outcomes of Haq *et al.* (2017) who also verified substantial differences in planting time effect on tillers and other yield contributing parameters. They also reported that late planting resulted reduced in tillers per plant on account of reason that vegetative phase of the plant squeezed and plant not attained the desired time for tillers development.

Spike length (cm): Data regarding the spike length as impacted by different planting times, genotypes and their interaction reflected substantial variances in planting times, cultivars and interaction of genotypes to planting times. For spike length, the planting times mean values ranged from 10.79 to 11.84 cm (Figure 2a). Maximum spike length of 11.84 cm was recorded when the planting was performed on 20th November (optimum planting time) followed by the 1st November (early planting). Whereas more postponement in planting abridged spike length and thus 10.79 cm was noted in plants cultivated on 30th December. For spike length, genotypes ranged from 11.05 to 11.80 (figure 2b). Maximum spike length of 11.80 cm was recorded in AZRC-Dera seconded by persabak-19 while minimum spike length of 11.05 cm was recorded in wadan-17. The remaining genotypes exhibited intermediate performance for spike length. In the genotypes x planting time interaction means, the spike length ranged from 10.32 to 12.39 cm in optimum and delayed plating respectively. Maximum spike length of 12.39 cm was recorded in genotype persabak-19 in optimum planting of 20th November which was statistically similar with same cultivar and AZRC-Dera and Israr-shaheed-17 in early planting. Minimum spike length was recorded in khaista-17 and wadan-17 in late planting wheat crop. The present outcomes are in confirmation with results of Mahdavi *et al.* (2022) who observed similar varying trend of spike length in wheat genotypes. Postponement in planting time caused a decrease in spike length. Previously, Yadav *et al.* (2023) and Sattar *et al.* (2023) also mentioned that delay in planting reduces the spike length and other yield contributing traits.

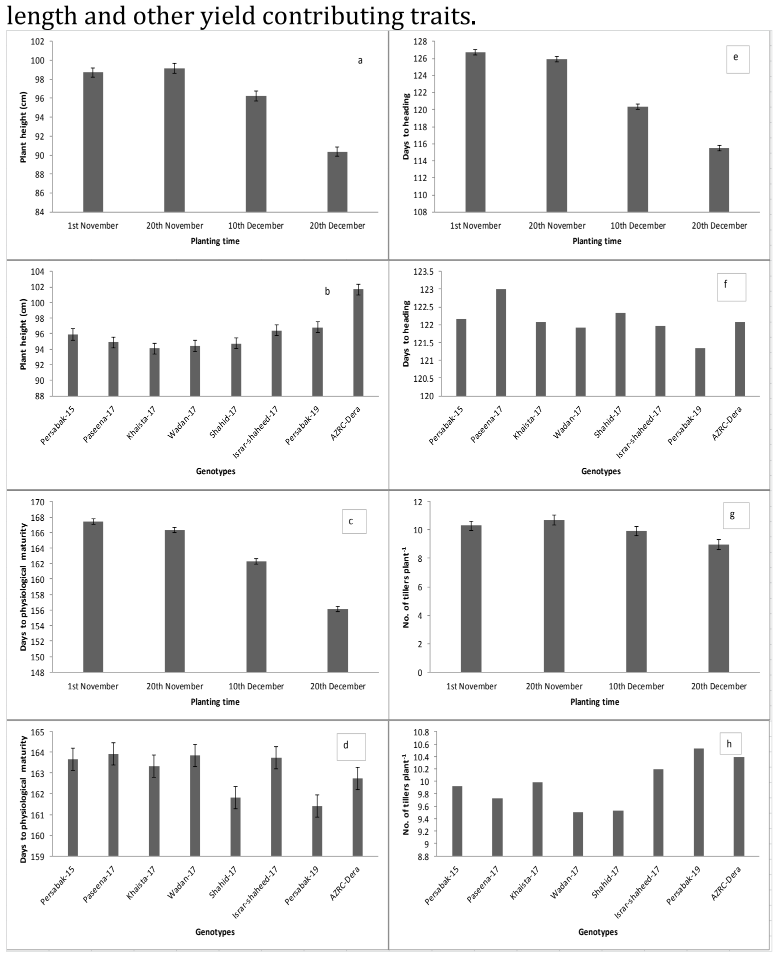

Figure 1: Plant height (a, b), days to physiological maturity (c, d), days to 50% heading (e, f) and No. of tillers plant^{-1} (g, h) of wheat as affected by planting times, cultivars and their interaction.

Number of spikelets per spike: The average performance of spikelets/spike as impacted by various planting times, genotypes and their interaction reflected substantial variances in planting times, cultivars and interaction of genotypes to planting times. For number of spikeletes per spike, the planting times mean values ranged from 17.25 to 18.64 (figure 2e). Maximum number of spikelets per spike of 18.64 was recorded when it was planted on 20th November (optimum planting) followed by 1st November (early planting). While more postponement in planting abridged spikelets per spike and therefore 17.25 was noted in plants sown on 30th December. For spikelets per spike, the genotypes fluctuated from 15.65 to 20.18. Highest spikelets per spike of 20.18 were noted in

AZRC-Dera seconded by Israr-shaheed-17 while minimum spikelets per spike of 15.65 was recorded in wadan-17 (Figure 2f). The remaining genotypes exhibited intermediate performance for spikelets per spike. In genotypes x planting time interaction means, the spikelets per spike fluctuated from 15.00 to 21.00 in optimum and delayed plating individually. Highest spikelets per spike of 21.00 was noted in genotype AZRC-Dera in optimum planting of 20th November which was followed by the same genotype in early planting. Minimum spikelets per spike was noted in wadan-17 both in early planting and late planting wheat crop. The outcomes are in confirmation with conclusions Mahdavi *et al.* (2022) who observed similar varying trend of number of spikelets per spike in wheat genotypes. Postponement in planting time caused decrease in spikelets per spike. Previously, Sattar *et al.* (2023) also mentioned that postponement in planting reduces spikelets per spike and other yield contributing traits.

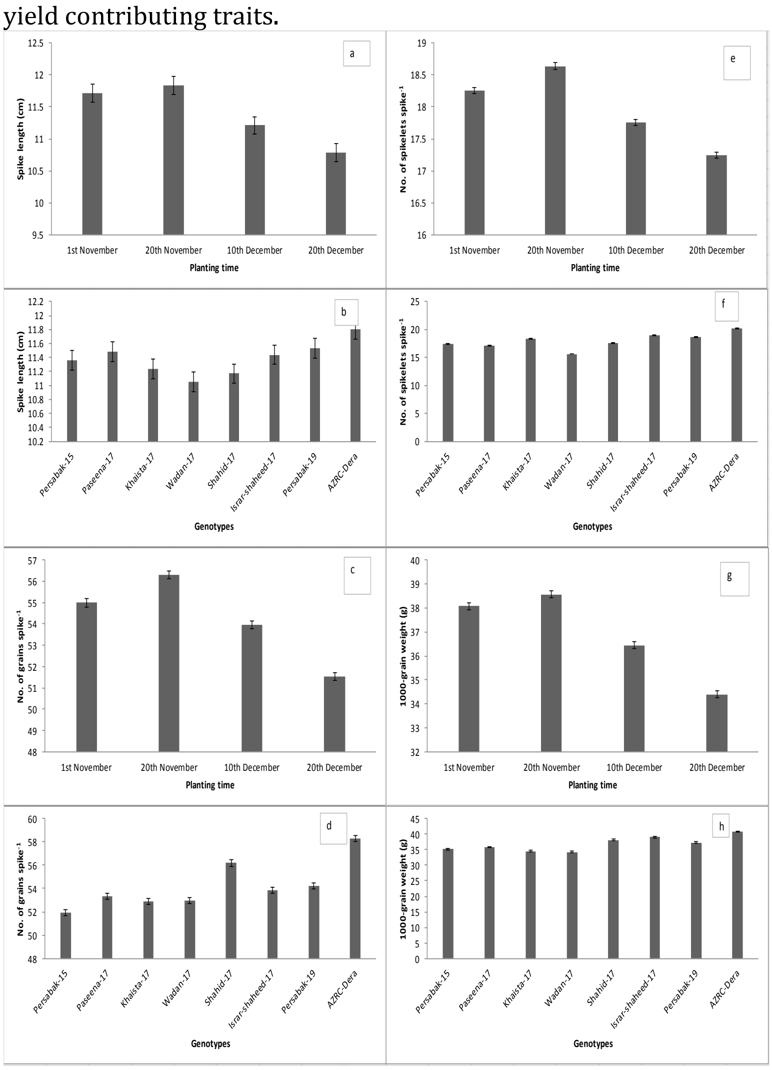

Figure 2: Spike length (a, b), No. of grains spike-1 (c, d), No. of spikelets spike-1 (e, f) and 1000-grain weight of wheat as affected by planting times, cultivars and their interaction.

No. of grains per spike: ANOVA of grains per spike reflected substantial variances in planting times, cultivars and interaction of genotypes to planting times. For grains per spike, planting times values ranged from 51.54 to 56.30 (Figure 2c). Maximum grains per spike of 56.30 was recorded when the planting was performed on 20th November (optimum planting time) followed by the 1st November (early planting). While more postponement in planting abridged grains per spike and thus 51.54 was noted in plants sown on 30th December. For number of grains per spike, the genotypes ranged from 51.91 to 58.28 (figure 2d). Highest grains per spike of 58.28 was recorded in AZRC-Dera seconded by shahid-17 while minimum grains per spike of 51.91 was noted in persabak-15. The remaining genotypes exhibited intermediate performance for grains per spike. In genotypes x planting time interaction means, grains per spike fluctuated from 49.66 to 60.66 in optimum and delayed plating respectively. Maximum grains per spike of 60.66 was noted in genotype AZRC-Dera in optimum planting of 20th November which was followed by the same genotype and in early planting. Minimum grains per spike was noted in persabak-15 in late planting wheat crop. The outcomes are in confirmation with verdicts Mahdavi *et al.* (2022) as similar varying trend of number of grains per spike in wheat genotypes. Postponement in planting time caused decrease in grains per spike. Previously Haq *et al.* (2017); Yadav *et al.* (2023) mentioned that delay in planting reduces the grains per spike and other spike traits.

Thousand grain weight: The data regarding the thousand grain weight reflected significant variances in planting times, cultivars and interaction of genotypes to planting times. For 1000 grain weight, the planting times mean values ranged from 34.40 to 38.57 grams (figure 2g). Highest thousand grain weight of 38.57 g was noted when the planting was performed on 20th November (optimum planting time) followed by the 1st November (early planting). While more postponement in planting abridged 1000 grain weight and thus 34.40 g was noted in plants sown on 30th December. For thousand grain weight, the genotypes fluctuated from 34.26 to 40.82 g (figure 2h). Highest thousand grain weight was noted in AZRC-Dera seconded by Israr-shaheed-17 whereas lowest thousand grain weight was recorded in khaista-17. The remaining genotypes exhibited intermediate performance for 1000 grain weight. In the genotypes x planting time interaction means, thousand grain weight fluctuated from 31.66 to 42.91 g. Highest thousand grain weight of 42.91g was recorded in genotype AZRC-Dera in optimum planting of 20th November which was statistically similar with same cultivar in early planting followed by Israr-shaheed-17 in optimum planting of 20th November. Lowest thousand grain weight was recorded in wadan-17 and khaista-17 in late planting wheat crop. The outcomes are in confirmation with conclusions Yadav *et al.* (2023) as similar varying trend of 1000 grain weight in wheat genotypes. Postponement in planting time caused decrease in 1000 grain weight. Previously, Hamam and Khaled (2009) also mentioned that delay in planting reduces the 1000 grain weight and other yield contributing traits.

Grain yield per plant: Mean values of grain yield per plant of wheat cultivars as prejudiced by planting time and their interaction depicted high significant variances for wheat cultivars and planting times. For grain yield genotypes ranged from 22.23 to 27.04 g yield per plant. In genotypes, maximum grain yield per plant was recorded in the AZRC-Dera (27.04 g) followed by wadan-17 and persabak-19 (figure 3b). Whereas lowest grain yield was recorded in the genotype paseena-17. The remaining genotypes depicted the intermediate performance. The planting times for grain yield ranged from 21.98 g to 24.37 g. It was observed that early (1st November) and optimum (20th November) planting depicted the maximum grain yield per plant while delay in planting after 20th November gradually reduced the grain yield in wheat genotypes. In the present investigation sufficient differences in grain yield in wheat genotypes and planting times were observed which are in confirmation with previous results of Sattar *et al.* (2023); Mahdavi *et al.* (2022); Haq *et al.* (2017); as remarkable differences in grain yield under the influence of planting times.

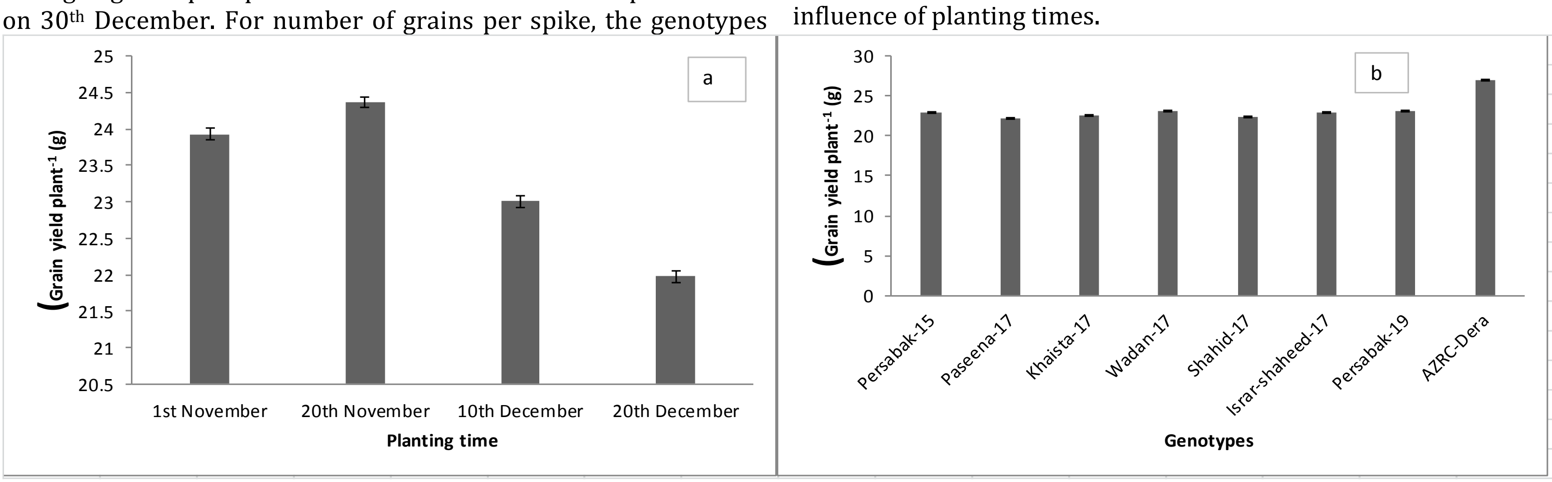

Figure 3: Grain yield plant-1 of wheat as affected by planting times, cultivars and their interaction.

CONCLUSION: The instant results concluded that planting time and genotypes play a major role in phenotypic manifestation of various attributes. Overall the grain yield of all the genotypes were reduced with delayed planting. 20th November was declared as the optimum wheat planting time and it was found that delay after 20th November considerably reduces the grain yield. Genotype AZRC-Dera performed better with better harvest at optimum planting followed by persabak-19, paseena-17 and Israr-shaheed-17. Based on these conclusions it is suggested that AZRC-Dera, paseena-17 and Israr-shaheed-17 must be cultivated from 1st November to 20th November.

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LIFE SCIENCE REPORTING: In current research article no life science threat was reported.

ETHICAL RESPONSIBILITY: This is original research, and it is not submitted in whole or in parts to another journal for publication purpose.

INFORMED CONSENT: The author(s) have reviewed the entire manuscript and approved the final version before submission.

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