

STUDY OF YIELD ATTRIBUTING TRAITS FOR IDENTIFICATION OF IDEAL WHEAT (*TRITICUM* SPP.) GENOTYPES FOR CHANGING CLIMATE OF CHHATTISGARH

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Abstract: The present experiment entitled Study of yield attributing traits for identification of ideal wheat (*Triticum* spp.) genotypes for changing climate of Chhattisgarh was conducted at Department of Genetics and Plant Breeding, Indira Gandhi Krishi Vishwavidyalaya, Raipur during rabi 2009-10. Significant variability for all the observed characters in the materials due to genotypes indicated better scope for selection. Genotypes HI 8691, HI 1568, LOK 62 and GW 322 showed tolerance towards the higher temperature and gave higher yield in comparison to rest of the genotypes.

Keywords: Wheat, *Triticum*, climate, Chhattisgarh

INTRODUCTION

Wheat, belonging to Graminae (Poaceae) family and genus *Triticum*, is the world's largest grown cereal crop. It has been described as the 'king of cereals' because of the acreage it occupies, high productivity and the prominent position it holds in the international food grain trade.

India, one of the greatest success stories of scientific achievement for welfare of mankind, is the second largest producer of wheat in the world after China. Wheat is the second most important crop after rice in India has touched a new height of 625.56 metric ton in 2009-10 (Anonymous, 2010) from 217 million hectare area. On the other hand, India is also the second largest wheat consumer after China. Thus, wheat and its various products play an increasingly important role in managing India's food security and India became the wheat surplus nation as against the wheat deficient nation during 1960's. The tremendous progress in area, production and productivity of wheat to the tune of 2.9, 12.2 and 4.2 times, respectively as compared to 1950 has made India the member of elite group of wheat exporting countries (Singh, 2010). Global warming and erratic or very limited winter rains and hot winds in wheat growing season have become a matter of great concern affecting wheat production not only in India but at global level (Jaiswal et al. 2010).

In Chhattisgarh, wheat is sown in an area of 0.171 million hectare out of which 0.063 million hectare area is irrigated and 0.108 million hectare area is unirrigated, with the total production of 181000 metric tons and productivity 1140 kg ha⁻¹ (Anonymous, 2010).

Terminal heat and drought are two major abiotic stresses that limit wheat productivity in arid and semi-arid regions of the world. According to an estimate, in the developing world (19 countries), more than half (57.3%) of the wheat crop is adversely affected by heat stress leading to as much as 31% reduction in yield. High temperatures

(>30°C) at the time of grain filling decreases grain filling as well as total grain filling period in wheat which result in reduction in yield. Taking into consideration the current trends of climate change and predictions of global warming, there is need to identify genotypes that have yield potential under both stress as well as non stress conditions. (Sareen *et al.*, 2010)

MATERIAL AND METHOD

The field experiment was conducted during the rabi 2009-10 at the Instructional cum Research Farm of College of Agriculture Raipur, Indira Gandhi Krishi Vishwavidyalaya, is located between 17°14'N and 24°45'N latitudes and 73°30' E and 84°15' E longitudes, whereas Raipur the capital of the Chhattisgarh state, lies at 21°16'N latitude and 81°36' E longitude with an altitude of 289.60 meters above sea level. In the Raipur the expansion of winter is very less and the cold is experienced in December and January months.

The experimental material consists of 21 wheat varieties obtained from department of Genetics and Plant Breeding, College of Agriculture, Raipur (HI 1568, GW 322 , UAS 321, AKDW 4021 (d)*, MPO 1215 (d) , HI 1544, LOK 62, MACS 3744(d), MACS 6274, GW 411, HI 8703 (d), HI 8498(d) , AKAW 4493, LOK 1, HI 8740 (d), NIAW 1549, GW 408, HW 5207-1*, HI 8691(d)*, MACS 3742 (d), HI 1567) The experiment was laid out in Random Block Design (RBD) with four replications. Each genotype was grown in a plot of 10 rows of 5 meter length each with a spacing of 23 cm apart between rows. The crop was provided with protective irrigations and recommended doses of fertilizers. Observations recorded in each plot, on five random plants. By taking the average, the mean value for the treatment was computed. The ten characters studied viz., Days to 50% Flowering, Days to Maturity, Plant Height (cm), No. of Tillers per Plant, 1000 Seeds Weight (g), No. of Seeds per Ear Head, Grain Yield

(kg/plot), Ear head length, Biological Yield (kg/plot), Harvest index (%)

Statistical analysis

Analysis of variance

Analysis of variance was worked out for each character separately. Procedure of analysis of variance adopted was as per Cochran and Cox (1957). For this the data for each character was arranged in tabular form as follows:

Genotype	Replication		Genotype total
	R I	R II	
1	X _{1,1}	X _{1,2}	X _{1.}
2	X _{2,1}	X _{2,2}	X _{2.}
3	X _{3,1}	X _{3,2}	X _{3.}
.	.	.	.
-	.	.	.
I	X _{i1}	X _{i2}	X _{i.}
Replication total	X _{.1}	X _{.2}	Grand total X _{..}

Where,

X=Observation

X₁₁=Observation of first genotype in first replication

X₁₂=Observation of first genotype in second replication

X_{1.}=Total of observation of first genotype of both replications

X_{.1}=Total of observations of all genotypes in first replication

X_{..}=Grand total of observations of all genotypes in both replications.

Computation of sums of squares (S.S.)

1. Correction Factor (CF)

$$\text{CF} = \frac{(\text{Grand Total of all observations})^2}{\text{Number of observations}}$$

$$\text{C.F.} = \frac{(\text{Grand Total of all observations})^2}{\text{Number of observations}}$$

2. Total S.S. = sums of squares of individual observation - CF

3. Genotypes S.S.

$$\text{Sums of squares of genotype totals}$$

$$= \text{Sums of squares of genotype totals} - \text{CF}$$

$$\text{Number of replications}$$

4. Replication S.S.

Sums of squares of Rep. totals

$$= \text{Sums of squares of Rep. totals} - \text{CF}$$

Number of genotypes

5. Error S.S.

$$= \text{Total S.S.} - \text{Genotypes S.S.} - \text{Replication S.S.}$$

Table 1. Analysis of variance for different characters in wheat (mean sum of squares) during (*rabi* 2009-10)

Source of variance	d. f.	Days of 50% flowering	Days to maturity	Plant height (cm)	Number of tillers/plant	Number of seeds /ear head	Ear head length (cm)	1000 seed weight (g)	Grain yield/plot (kg/plot)	Biological yield (kg/plot)	Harvest index (%)
Replication	3	1.541	0.937	47.64**	1.710**	1.218	0.257	0.447	1.048**	0.656	49.664**
Genotype	20	90.615**	35.350	65.265**	2.536**	55.290**	7.038**	126.677*	0.524**	6.070**	26.607**
Error	60	2.052	56.562	9.701	0.171	4.601	0.253	2.169	0.128	0.530	8.788

** , * Significant at 1% and 5% level

RESULT AND DISCUSSION

The significant variance due to genotypes were observed for days to 50% flowering, plant height, number of tillers per plant, number of seeds per ear head, ear head length, 1000 seed weight, grain yield per plot, biological yield per plot and harvest index except for days to maturity and are presented in Table 1. Significance of variability for all the observed characters in the materials due to genotypes indicated better scope for selection. This finding is in agreement with the findings of Sachan and Singh (2003), Bilgin et al.(2009), Thanna et al. (2011) and Rashidi (2011).

Genotypes HI 8691, HI 1568, LOK 62 and GW 322 having better contribution of these traits, due to which they perform better even in higher temperature during reproductive and grain filling stage for normal growth and the development of wheat crop requires

cold weather but as weather data showed as soon as crop comes in reproductive or milking stage the atmospheric temperature increases suddenly which leads to forced maturity of crop. However, genotypes HI 8691, HI 1568, LOK 62 and GW 322 showed tolerance towards the higher temperature and ultimately these genotypes gave higher yield in comparison to rest of the genotypes. Therefore it can be presented that these genotypes showed tolerance toward higher temperature at later stages.

CONCLUSION

To conclude the present study it can be significant variability was observed for all the characters in the materials and which indicates better scope for selection. Genotypes HI 8691, HI 1568, LOK 62 and GW 322 showed tolerance towards the higher

temperature and gave higher yield in comparison to rest of the genotypes.

Suggestion for future work

There is need to reconfirm the results with normal date of sowing as well as delayed sowing dates. Studies of more wheat varieties/ genotypes should be taken for identification of higher temperature tolerance. Crosses can be attempted between heat tolerant varieties with agronomically established varieties to transfer this character in agronomically established variety.

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REFERENCES

- Cochran, W. G. and Cox, G. M.** (1957). *Experimental Designs*. Asia Publication House, Bombay. pp. 127-131.
- Sachan, M. S. and Singh, S. P.** (2003). Genetics of yield and its components in durum wheat (*Triticum durum* Desf.). *J. Interacademia*, 7(2): 140-143.
- Bilgin, O., Baser, I., Kayihan, Z., Korkut, T. G., Alpaly, B. and Nezihi, S.** (2009). Variations for grain yield and milling value of durum wheat landraces and obsolete cultivars. *The Philippine Agricultural Scientist*, 92(1):23-26.
- Anonymous, Status Report** (2007-08 to 2009-10). Indira Gandhi Krishi Vishwavidyalaya, Raipur IGKV/Pub/2010/19-120.
- Singh, S.S.** (2010). Domestic wheat production and future prospects. *8th International Wheat Conference Abstracts 2010 St. Petersburg, Russia*. pp. 346-348.
- Jaiswall, J. P., Bhowmick, P. K. and Grover, A.** (2010). Selection of bread wheat genotypes for heat tolerance based on physiological traits and heat shock proteins. In *8th International Wheat Conference Abstracts St 2010. Petersburg, Russia*, pp163.
- Sareen, S., Tyagi, B. S., Singh, G., Shoran, J. and Singh, S.S.** (2010). Evaluation of wheat synthetic hexaploids for heat tolerance using stress indices. In *8th International Wheat Conference Abstracts 2010 St. Petersburg, Russia*, pp. 190.
- Thanna, H.A., Abd, El-K. and Aml, E.A. El Saidy** (2011). Evaluation of yield and grain quality of some bread wheat genotypes under normal irrigation and drought stress conditions in calcareous soils. *Journal Biology Science*, 11(2) :156-164.
- Rashidi, V.** (2011). Genetic Parameters of some Morphological and Physiological Traits in Durum Wheat Genotypes (*Triticum durum* L.). *African J. Agri. Res.*, 6(10) pp. 154-162.

