SHORT COMMUNICATION

TO STUDY OF CORRELATION COEFFICIENTS FOR YIELD COMPONENT IN WHEAT (TRITICUM SPP.) FOR IDENTIFICATION OF IDEAL 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. Grain yield per plot showed highly significant positive correlation with biological yield at phenotypic level (0.704) and also at genotypic level (0.959). Ear head length showed highly significant positive correlation at phenotypic level with biological yield (0.605) and significant positive correlation with grain yield per plot (0.503). Number of tillers per plant exhibited significant positive correlation of both phenotypic and genotypic level with grain yield (0.492, 0.443), and biological yield (0.505, 0.441), respectively. 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, correlation coefficients, 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 (Jaiswal1 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 (> 30^0C) 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

Correlation coefficients analysis measures the mutual relationship between various characters at genotypic (g), phenotypic (p) and environmental levels with the help of following formula suggested by Miller *et al.* (1958).

Estimation of Correlation coefficients

Genotypic correlation coefficient between characters x and y

$r_{xy\,(g)} = Cov_{xy\,(g)} / \sqrt{(Var_{x\,(g)} \times Var_{y\,(g)})}$

2. Phenotypic correlation coefficient between characters x and y

$r_{xy\,(p)} = Cov_{xy\,(p)} / \sqrt{(Var_{x\,(p)} \times Var_{y\,(p)})}$

Where,

$r_{xy\,(g)}$ = Genotypic correlation coefficient between x and y

$r_{xy\,(p)}$ = Phenotypic correlation coefficient between x and y

$Cov_{xy\,(g)}$ = Genotypic covariance between x and y

$Cov_{xy\,(p)}$ = Phenotypic covariance between x and y

$Var_{x\,(g)}$ = Genotypic variance of x

$Var_{x\,(p)}$ = Phenotypic variance of x

$Var_{y\,(g)}$ = Genotypic variance of y

$Var_{y\,(p)}$ = Phenotypic variance of y

Table 1. Correlation coefficients of yield attributing characters with grain Yield at environmental, genotypic and phenotypic

CHARACTERS		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 (%)
Days of 50% flowering	P	0.245	0.439*	0.193	0.006	0.369	-0.163	0.248	0.244	-0.032
	G	0.264	0.581**	0.244	0.022	0.405	-0.166	0.444*	0.327	-0.026
	E	0.009	0.064	-0.091	-0.078	0.08	-0.123	-0.145	-0.144	-0.073
Days to Maturity	P		0.025	-0.017	-0.006	0.327	-0.493*	0.037	0.214	-0.187
	G		0.001	-0.01	-0.022	0.359	-0.525*	0.095	0.271	-0.282
	E		0.152	-0.073	0.101	0.026	-0.007	-0.129	-0.072	-0.143
Plant height (cm)	P			0.455*	-0.118	0.187	0.04	0.302	0.267	0.029
	G			0.540*	-0.152	0.305	0.02	0.622**	0.407	0.182
	E			0.295	-0.053	-0.136	0.157	-0.026	0.006	-0.1
Number of tillers/plant	P				0.071	0.273	-0.231	0.443*	0.488*	-0.018
	G				0.087	0.338	-0.298	0.492*	0.505*	-0.155
	E				0.02	-0.026	0.188	0.443*	0.441*	0.158
Number of seeds /ear head	P					0.097	-0.016	0.199	0.122	-0.017
	G					0.054	-0.028	0.283	0.124	-0.004
	E					0.29	0.05	0.102	0.119	-0.036
Ear head length (cm)	P						-0.455*	0.503*	0.605**	-0.261
	G						-0.504*	0.743**	0.757**	-0.553**
	E						-0.002	0.171	0.027	0.13
1000 seed weight (g)	P							-0.16	-0.288	0.093
	G							-0.242	-0.393	0.163
	E							-0.03	0.26	0.009
Grain yield/plot (kg/plot)	P								0.704**	0.241
	G								0.959**	-0.176
	E								0.422	0.503*
Biological yield (kg/plot)	P									-0.190
	G									-0.424
	E									0.045

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

RESULT AND DISCUSSION

The genotypic, phenotypic and environmental correlations were determined among yield components in all possible character combinations and are presented in table 1.

Days to 50% flowering showed significant positive correlation with plant height (0.439) at phenotypic level whereas, at genotypic level this character exhibited positive correlation with plant height (0.581) and grain yield per plot (0.444). Days to maturity exhibited significant negative correlation with 1000 seed weight at both genotypic level and phenotypic level. Plant height showed significant positive correlation with number of tiller per plant at phenotypic and genotypic level whereas, highly

significant positive correlation of plant height with grain yield (0.622) was observed of genotypic level. Number of tillers per plant exhibited significant positive correlation at phenotypic genotypic level and environmental levels with grain yield (0.492, 0.443, 0.447), and biological yield (0.505, 0.488, 0.441), respectively. Ear head length showed highly significant positive correlation 0.757 and 0.605 with biological yield at genotypic and phenotypic levels relatively, with grain yield per plot (0.743) at genotypic level and significant positive correlation 0.503 with grain yield per plot at phenotypic level. This character also showed highly significant negative correlation with harvest index (-0.553) at genotypic levels and significant negative correlation with 1000 seed weight (-0.504, -0.455) at genotypic and phenotypic levels respectively.

Grain yield per plot showed highly significant positive correlation with biological yield at phenotypic level (0.704) and also at genotypic level (0.959). It also observed significant positive correlation (0.503) with harvest index at environmental level. Correlation studies gives a clear picture of character association which is generally due to linkage, pleiotropy, physiological association in developmental and biochemical pathway. Though, linkage is a cause of transient correlations of traits particularly in population derived from crosses between two species. Pleiotropy is simply a property of a gene whereby it affects two or more characters, so that if the gene is segregating it causes simultaneous variations in those characters. Correlated characters are of much interest because of change in one characters brought by selection, bring simultaneous change in associated character.

A positive correlation between desired characters is favorable to the breeder as it helps in selection;0258 however, a negative correlation hinders the recovery of the combinations in both characters. When the characters are genetically correlated among themselves, in such situations any strong selection applied to one character also brings change in other characters.

Similar finding were reported by Boyadzhieva (1987), Kumar and Singh (1993), Sultanov and Dolotovskii (1994), Shoran *et al* (2000), Sheikh and Singh (2001), Singh *et al* (2003), Khaliq *et al.* (2004), Kumar *et al*. (2004), Mahmood *et al*. (2006), Kumar *et al.* (2009) and Khan and Dar (2010).

CONCLUSION

Grain yield per plot showed highly significant positive correlation with biological yield at phenotypic level (0.704) and also at genotypic level (0.959). Ear head length showed highly significant positive correlation at phenotypic level with biological yield (0.605) and significant positive correlation with grain yield per plot (0.503). Number of tillers per plant exhibited significant positive correlation of both phenotypic and genotypic level with grain yield (0.492, 0.443), and biological yield (0.505, 0.441), respectively.

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.

ACKNOWLEDGMENT

With a sense of high resolve and reverence my sincere and deep sense of gratitude to adorable Dr. Rajeev Shrivastava Assistant Professor, Department of Genetics and Plant Breeding, College of Agriculture, Raipur (C.G.) who is Chairman of my Advisory Committee, for his inspiring guidance, constructive criticism and timely advisement during the entire course of investigation and preparation of manuscript. His scientific approach and generosity guided me in right direction and it has been my privilege to work under her supervision, knowledge and enthusiastic interest, which he provided me thought out my post graduation and research investigation despite her busy schedule of work.

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