Annals of Plant Sciences 7.2 (2018) pp. 2078-2081

ANNALS OF PLANT SCIENCES
ISSN: 2287-688X
OPEN ACCESS
www.annalsofplantsciences.com

Research Article

Estimation of correlation coefficient study of some quantitative traits in wheat

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Received: 1/16/2018; **Revised:** 1/23/2018; **Accepted:** 1/30/2018

Abstract: Wheat is the world's most important crop that excels all other cereal crops both in area and production, thereby providing about 20.0 per cent of total food calories for the people of the world. The experiment was conducted at Research Farm, IGKV, Raipur during *Rabi* 2013-14. Chhattisgarh is located in the east - central part of the country 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. All Twenty two genotypes were grown in Randomized Block Design with three replications. Correlation studies give a clear picture of characters association which is generally due to linkage, pleiotrophy, physiological association in developmental and biochemical pathway The phenotypic and genotypic correlations were determined among seed yield and its components in possible character combinations. In Correlation coefficient analysis, seed yield per plant exhibited highly significant positive correlations with number of seeds per spike and number of seeds per plant at both genotypic and phenotypic levels, whereas number of seeds per spikelet at the genotypic level.

Keywords: Correlation coefficient, yield components, variability, wheat

Introduction

Wheat is the world's most important crop that excels all other cereal crops both in area and production, thereby providing about 20.0 per cent of total food calories for the people of the world. Nearly 95% of wheat grown today is hexaploid, used for the preparation of bread and other baked products (Debasis and Khurana, 2001). The husk bran and germ are rich sources of vitamins, minerals and protein (David and Adams, 1985). Since ages, wheat has been playing an important role in the economy several countries (Singh *et al.,* 2010).Globally, the total area under cultivated of wheat is 227 million hectares, production of wheat is 654 million metric tonnes and the productivity was recorded as 3 tonne per hectare during 2012-2013 (Anonymous, 2014 a). India also has the larger area under wheat. About 90 percent of total wheat production is contributing by five states viz., Uttar Pradesh, Punjab, Haryana, Madhya Pradesh and Rajasthan. The other wheat producing states are Bihar, Gujarat, Jammu and Kashmir, Maharashtra, West Bengal and Chhattisgarh. In India the area, production and productivity of this crop is 29.8 million hectares, 93.90 million metric tonne and 2.96 tonnes per hectare, respectively during 2012-2013 (Anonymous, 2014 b). The development of high yielding wheat cultivars is the main objective of any breeding programs in the world (Ehdaie and Waines, 1989). Identification of better genotypes with desirable traits and their subsequent use in breeding program and establishment of suitable selection criterion can helpful for successful Varietals improvement program. Analysis of variability among the traits and the association of a particular character in relation to other traits contributing to yield of a crop would be great importance in planning a successful breeding program (Mary and Gopalan, 2006). Evolution of varieties with high yield potential accompanied with desirable combination of traits has always been the major objective of wheat breeding programme. Wadington *et al.,* (1986) reported that 1,000 grain weight was reduced slightly in modern high grain number cultivars. Yield is one such character that results due to the actions and interactions of various component characters (Grafius, 1960). It is also widely recognised that genetic architecture of yield can be resolved better by studying its component characters. This enables the plant breeder to breed for high yielding genotypes with desired combinations of traits. The correlations are very important in plant breeding, because of its reflection in dependence degree between two or more traits. If there is genetic correlation between traits, in the case of direct selection of one trait can cause change in other trait. Correlations between traits are depending of genetic and environmental factors (Falconer, 1981). Environmental conditions can variability, not only of some trait but interrelationship between its. The objective of this study was to establish the inter-relationship of various wheat components among themselves and with yield. Correlation are very important in plant breeding, because of its Correlation is useful in disclosing the magnitude and direction of the

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relationship between various yield contributing traits and yield. Positive correlation between desirable traits are supposed to be favourable and help to breeder in selection whereas, negative correlations hinders the recovery of the combinations in both characters. Correlation studies provide a better understanding of the association of different characters with grain yield (Dixet and Dubey, 1984).

Materials and Methods

Twenty two wheat genotypes including check varieties were used in this study. All the twenty two genotypes were grown in Randomized Block Design with three replications during *Rabi* 2013-14 at the Instructional cum Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur. Chhattisgarh is located in the east - central part of the country 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 each replication twenty two treatments were grown in 10 rows, 5 m long and 20 cm apart. Five randomly selected plants from each treatment were tagged for recording the observations on the following characters, viz., Days to 50 % flowering, Days to maturity, Plant height, Number of tillers per plant, Spike length, Number of spikelets per spike, Number of seeds per spikelet, Number of seeds per spike, Number of seeds per plant, 1000-seed weight, Seed yield per plant, Biological yield per plot, Seed yield per plot and Harvest Index. The correlation coefficients were worked out to determine the degree of association of a character with yield and also among the yield components. The phenotypic and genotypic correlations were determined among seed yield and its components in all possible character combinations. Genotypic and phenotypic correlations were calculated by using the formula given by Weber and Moorthy, 1952; Miller (1958). Genotypic correlations were computed using variance and co-variances as suggested by Johnson *et al.,* (1955). Phenotypic correlation was calculated by the formula suggested by Al-Jibouri *et al.,* (1958)

Results and Discussion

Correlation coefficient analysis

Correlation studies give a clear picture of characters association which is generally due to linkage, pleiotrophy, physiological association in developmental and biochemical pathway. Though, the linkage is a cause of transient correlations particularly in population derived from crosses between two species. Pleiotrophy is simply a property of a gene whereby it affects two or more characters, so that if the gene is segregating it causes variations in those characters. The characters which are correlated are of much interest since change in one character influenced the other one. The phenotypic and genotypic correlations were determined among seed yield and its components in all possible character combinations.

Genotypic correlation analysis

Genotypic correlations were determined among seed yield and its components in all possible character combinations and are presented in Table 1. Days to 50 % flowering exhibited significant positive correlation with days to maturity (0.778), whereas, significant negative correlation with number of seeds per spikelet (-0.733), number of seeds per plant (-0.554), seed yield per plant (-0.448) and number of seeds per spike (-0.424). Days to maturity had significant positive correlation with number of spikelets per spike (0.500), whereas, significant negative correlation with number of seeds per spikelet (-0.735) and seed yield per plant (-0.508). Plant height exhibited significant positive correlation with number of tillers per plant (0.502) and spike length (0.842), whereas, significant negative correlation with harvest index (-1.030), seed yield per plot (-0.892), biological yield per plot (- 0.774), seed yield per plant (-0.746), number of seeds per plant (-0.642), 1000-seed weight (-0.573). Number of tillers per plant showed significant positive correlation with spike length (0.790), whereas, significant negative correlation with 1000-seed weight (-0.698) and harvest index (-0.649). Spike length had significant negative correlation with harvest index (- 0.826), 1000-seed weight (-0.782) and seed yield per plot (-0.539). Number of spikelets per spike had significant negative correlation with biological yield per plot (-0.711), seed yield per plot (0.569) and seed yield per plant (-0.492). Number of seeds per spikelet exhibited significant positive correlation with number of seeds per spike (0.487) and seed yield per plant (0.629). Number of seeds per spike showed significant positive correlation with number of seeds per plant (0.801) and seed yield per plant (0.726), whereas, significant negative correlation with 1000-seed weight (-0.424). Number of seeds per plant exhibited significant positive correlation with seed yield per plant (0.877), biological yield per plot (0.730), seed yield per plot (0.824) and harvest index (0.794). 1000-seed weight showed significant positive correlation with harvest index (0.700). Seed yield per plant had significant positive correlation with biological yield per plot (0.764), seed yield per plot (0.813) and harvest index (0.673). Biological yield per plot exhibited significant positive correlation with seed yield per plot (0.980) and harvest index (0.816). Seed yield per plot had significant positive correlation with harvest index (0.919). Similar finding were reported by Kumar *et al.,* (2013), Nukasani *et al.,* (2013) and and Keddam *et al.,* (2014).

Table 1. Genotypic correlation coefficients among different yield traits in wheat

	Days to maturity	Plant height (cm)	No. of tillers per plant	Spike length (cm)	No. of spikelets per spike	No. of seeds per spikelet	No. of seeds per spike	No. of seeds per plant	1000 seed weight (g)	Seed yield per plant (g)	Biological yield per plot (g)	Seed yield per plot (g)	Harvest index (%)
Days to 50 % flowering	0.778**	0.152	0.025	-0.091	0.181	-0.733**	-0.424*	-0.554**	-0.077	-0.448*	-0.341	-0.340	-0.161
Days to maturity		0.406	0.260	0.325	0.500*	-0.735**	-0.059	-0.409	-0.418	-0.508*	-0.364	-0.395	-0.344
Plant height (cm)			0.502*	0.842**	0.363	0.129	-0.150	-0.642**	-0.573**	-0.746**	-0.774**	-0.892**	-1.030**
No. of tillers per plant				0.790**	-0.267	0.327	0.275	-0.049	-0.698**	-0.083	-0.346	-0.410	-0.649**
Spike length (cm)					0.140	0.185	0.328	-0.147	-0.782**	-0.374	-0.399	-0.539**	-0.826**
No. of spikelets per spike						-0.203	0.051	-0.373	-0.263	-0.492*	-0.711**	-0.569**	-0.347
No. of seeds per spikelet							0.487*	0.408	-0.077	0.629**	0.303	0.171	-0.319
No. of seeds per spike								0.801**	-0.424*	0.726**	0.332	0.353	0.132
No. of seeds per plant									0.105	0.877**	0.730**	0.824**	0.794**
1000 seed weight (g)										0.182	0.272	0.399	0.700**
Seed yield per plants (g)											0.764**	0.813**	0.673**
Biological yield per plot (g)												0.980**	0.816**
Seed yield per plot (g)													0.919**

Table 2. Phenotypic correlation coefficients among different yield traits in wheat

	Days to maturity	Plant height (cm)	No. of tillers per plant	Spike length (cm)	No. of spikelets per spike	No. of seeds per spikelet	No. of seeds per spike	No. of seeds per plant	1000 seed weight (g)	Seed yield per plant (g)	Biological yield per plot (g)	Seed yield per plot (g)	Harvest index (%)
Days to 50 % flowering	0.755**	0.147	0.035	-0.082	0.128	-0.426*	-0.307	-0.489*	-0.072	-0.295	-0.265	-0.287	-0.084
Days to maturity		0.356	0.163	0.276	0.306	-0.393	-0.056	-0.373	-0.409	-0.351	-0.287	-0.330	-0.165
Plant height (cm)			0.406	0.632**	0.260	0.004	-0.075	-0.490*	-0.517*	-0.403	-0.504**	-0.713**	-0.537**
No. of tillers per plant				0.493*	0.018	0.129	0.287	-0.024	-0.470*	0.258	-0.045	-0.257	-0.364
Spike length (cm)					0.238	0.208	0.320	-0.110	-0.693	-0.133	-0.266	-0.349	-0.274
No. of spikelets per spike						0.096	0.273	-0.160	-0.172	-0.048	-0.210	-0.283	-0.194
No. of seeds per spikelet							0.352	0.232	-0.073	0.360	0.224	0.127	-0.099
No. of seeds per spike								0.591**	0.343	0.538**	0.265	0.272	0.086
No. of seeds per plant									0.079	0.589**	0.553**	0.596**	0.290
1000 seed weight (g)										0.077	0.191	0.319	0.327
Seed yield per plant (g)											0.571**	0.570**	0.239
Biological yield per plot (g)												0.771	0.085
Seed yield per plot (g)													0.680**

Phenotypic correlation analysis

Phenotypic correlations were determined among seed yield and its components in all possible character combinations and are presented in Table 2. Positive correlation between desirable traits are supposed to be favourable and help to breeder in selection whereas, negative correlations hinders the recovery of the combinations in both characters. Days to 50% flowering exhibited significant positive correlation with days to maturity (0.755), whereas, significant negative correlation with number of seeds per spikelet (-0.426) and number of seeds per plant (-0.489). Days to maturity showed positive and negative correlations which all were non-significant. Plant height had significant positive correlation with spike length (0.632), whereas, significant negative correlation with seed yield per plot (-0.713), harvest index (-0.537), 1000-seed weight (-0.517), biological yield per plot (-0.504) and number of seeds per plant (-0.490). Number of tillers per plant exhibited significant positive correlation with spike length (0.493), whereas, significant negative correlation with 1000-Seed weight (-0.470). Spike length, Number of spikelets per spike and number of seeds per spikelet showed positive and negative correlations which all were nonsignificant whereas, number of seeds per spike had significant positive correlation with number of seeds per plant (0.591) and seed yield per plant (0.538). Number of seeds per plant had significant positive correlation with seed yield per plant (0.589), biological yield per plot (0.553) and seed yield per plot (0.596). Whereas, 1000-seed weight showed positive correlations which all were nonsignificant. Seed yield per plant had significant positive correlation with biological yield per plot (0.571) and seed yield per plot (0.570). While biological yield per plot showed positive correlations which all were nonsignificant. Seed yield per plot exhibited significant positive correlation with harvest index (0.680). Present results confirms the finding of previous workers Majumdar *et al.,* (2008), Singh *et al.,* (2012), Kumar *et al.,* (2013) and Kaddem *et al.,* (2014).

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Cite this article as:

Shyam Chitralekha, P.K. Chandrakar, N.K. Rastogi, Umakant Banjare and Manoj Densena. Estimation of correlation coefficient study of some quantitative traits in wheat. *Annals of Plant Sciences 7.2 (2018) pp. 2078-2081.*

http://dx.doi.org/10.21746/aps.2018.7.2.17

Source of support: Nil
Conflict of interest: Nil