ISSN: 2319-6505

Available Online at http://journalijcar.org

International Journal of Current Advanced Research
Vol 5, Issue 4, pp 749-751, April 2016

International Journal of Current Advanced Research

ISSN: 2319 - 6475

RESEARCH ARTICLE

INTER-RELATIONSHIP BETWEEN GRAIN YIELD AND ITS COMPONENT CHARACTERS IN F_2 GENERATION OF BREAD WHEAT (*TRITICUM AESTIVUM* L)

Khushboo Singh[1*], M.S. Punia[2] and Vikram Singh[3]

[1, 2, 3] Department of Genetics and Plant Breeding CCS Haryana Agricultural University Hisar-125004, India

A R T I C L E I N F O

Article History:

Received 16th January, 2016
Received in revised form 24th February, 2016
Accepted 23rd March, 2016
Published online 28th April, 2016

Key words:

Wheat, correlation coefficient, path analysis.

A B S T R A C T

This study was carried out at Research Farm CCS Haryana Agricultural University, Hisar (India) during *Rabi* 2013-14 with 250 F_2 populations of cross WH1105 x WH711 to assess the correlation and path coefficient analysis. The correlation estimates showed positive and significant correlation of grain yield with number of tillers per plant, ear weight and 100 grain weight. However, it showed negative significant correlation with plant height. The Path coefficient analysis revealed that high positive direct effect of 100 grain weight followed by harvest index and biological yield. Traits viz., plant height and number of spikelets per ear had negative direct effect on grain yield per plant. Most of the other traits had indirect effect. Hence, for developing high yielding varieties in wheat, these traits should be given more weightage in breeding or selection programme.

INTRODUCTION

At present in India, wheat is the second most important cereal crop after rice, both in area and production. From "begging bowl" status in mid sixties, India has emerged as second largest producer of the wheat in the world after China and has increased production from 6.46 million tons in 1952 to 95.40 million tons in 2013-14 (Anon., 2014). Wheat is consumed in a variety of ways such as bread, chapatti, flour, suji, porridge etc. Most of the agronomic characters in crop plants are quantitative in nature. Yield is one such character that results due to the actions and interactions of various component characters. Direct selection for grain yield could be misleading, therefore, information on the genetic variability and correlation of morpho-agronomic traits with grain yield are helpful for making effective selection.

Correlation studies provide a knowledge of association between different characters and grain yield. The study of association among various traits is useful for breeders in selecting genotypes possessing groups of desired traits (Ali 2008). The path coefficient analysis provides a more realistic picture of the relationship as it considers direct as well as indirect effects of the variables by partitioning the correlation coefficients. More often correlation and path analysis using a set of genotypes is routine, but understanding the Relationship in segregating generations is also very important. To overcome the major threats including yield potential, incorporation of resistance against diseases and earliness, evaluation of genotypic performance of wheat segregating populations is a must for breeders.With this in view, a study was conducted to determine the interrelationship and direct And indirect effects of various wheat traits among themselves and with grain yield in segregating F_2 generation of wheat.

MATERIAL AND METHOD

The experiment was conducted at the Research Farm, Department of Genetics and Plant Breeding, Chaudhary Charan Singh Haryana Agricultural University Hisar (India) during *Rabi* 2013-14. The experiment comprising F_2 populations of a cross of wheat viz., 'WH1105× WH711' and their parents and F_1's were sown in the field alongwith 250 F_2 seeds were space planted in a row of two meter length, keeping plant to plant distance of 10 cm and row to row distance of 30 cm. Data were recorded at the time of maturity for various quantitative traits viz., plant height (cm), number of tillers per plant, number of spikelets per ear, ear length (cm), ear weight (g), number of grain per ear, grain weight per ear, number of grain per spikelet, 100 grain weight (g), biological yield per plant (g), grain yield per plant (g) and harvest index.

Data collected for various quantitative traits were analyzed. Correlation coefficients were estimated as the formula suggested by Johnson *et al*. (1955). Path coefficient (which is an extension of the regression model) used to test fitness of the correlation matrix against two or more causal models which are being compared; it measures the direct and indirect effect of yield related traits on grain yield by the method of Dewey and Lu (1959).

RESULTS

The knowledge of interrelationship of various traits with grain yield and among themselves also help the breeders in

improvement of a complex character like grain yield for which direct selection is not much effective. Recombination in segregating generation leads to formation of new pattern of association of linked characters, hence the correlation coefficient of various traits with grain yield per plant were estimated and presented in Table 1. Number of tillers per plant exhibited highly significant and very high magnitude of positive correlation with grain yield per plant. This apparently indicates that increased tillers number shall increase grain yield directly, hence while making selection for grain yield emphasis on this character may be given.

grain yield per plant. The significant negative association was also observed for plant height and number of tillers per plant; plant height and ear weight; number of spikelets per ear and 100 grain weight; number of tillers per plant and number of grains per ear; harvest index and biological yield. Similar findings were also reported for tillers per plant and grains per spike Khan *et al.* (2010); harvest index with biological yield Tripathi *et al.* (2011). Path coefficient analysis indicates only the manual association of various contributing characters with grain yield per plant.

Table 1 Estimates of correlation coefficients among various characters in F_2 population of bread Wheat in cross WH1105 x WH711

	PH	NTPP	EL	EW	NG/E	GW/E	NG/S	NS/E	100GW	GY/P	BY/P
PH											
NTPP	-0.824**										
EL	0.950**	-0.750**									
EW	-0.930**	0.855**	-0.848**								
NG/E	0.956**	-0.811**	0.931**	-0.884**							
Gw/E	-0.847**	0.781**	-0.755**	0.888**	-0.750**						
Ng/S	-0.958**	0.852**	-0.891**	0.948**	-0.910**	0.883**					
NS/E	0.963**	-0.822**	0.956**	-0.899**	0.943**	-0.812**	-0.926**				
100GW	-0.551**	0.553**	-0.496**	0.656**	-0.533**	0.604**	0.607**	-0.542**			
GY/P	-0.741**	0.751**	-0.688**	0.794**	-0.695**	0.737**	0.765**	-0.737**	0.867**		
BY/P	0.911**	-0.634**	0.903**	-0.838**	0.896**	-0.733**	-0.863**	0.891**	-0.499**	-0.604**	
HI	-0.972**	0.826**	-0.937**	0.920**	-0.935**	0.845**	0.949**	-0.960**	0.524**	0.736**	-0.893**

*, ** Significant at 0.05 and 0.01 level, respectively.
PH: Plant height, NTPP: Number of tillers per plant, EL:Ear length,EW: Eart weight, NG/E: Number of grains/ear GW/E: Grain weight/ear, NG/S: Numbe
r of grains/Spikelets, NS/E: Number of Spikelets/ear, 100 GW: 100 grain weight, BYP: Biological yield per plant, HI: Harvest index, GYP: Grain yield per plant.

Table 2 Path analysis showing direct (diagonal) and indirect effects of different characters on Grain yield/plant in wheat

	PH	NTP	EL	EW	NG/E	GW/E	NG/S	NS/E	100GW	BYP	HI
PH	-0.43340	-0.10532	-0.08934	-0.02999	0.28119	0.06118	0.16854	-0.13235	-0.37314	0.32538	-0.41382
NTP	0.35726	0.12776	0.07054	0.02754	-0.23857	-0.05639	-0.14982	0.11297	0.37458	-0.22651	0.35174
EL	-0.41154	-0.09579	-0.09409	-0.02734	0.27387	0.05452	0.15674	-0.13129	-0.33592	0.32247	-0.39924
EW	0.40324	0.10918	0.07980	0.03223	-0.26002	-0.06413	-0.16687	0.12356	0.44470	-0.29925	0.39179
NG/E	-0.41432	-0.10363	-0.08761	-0.02849	0.29413	0.05415	0.16007	-0.12955	-0.36126	0.31989	-0.39817
GW/E	0.36720	0.09976	0.07103	0.02863	-0.22055	-0.07221	-0.15540	0.11155	0.40894	-0.26189	0.35971
NG/S	0.41515	0.10880	0.08382	0.03057	-0.26759	-0.06378	-0.17595	0.12729	0.41103	-0.30842	0.40404
NS/E	-0.41748	-0.10505	-0.08991	-0.02899	0.27736	0.05863	0.16301	-0.13739	-0.36708	0.31845	-0.40877
100GW	0.23867	0.07063	0.04664	0.02115	-0.15682	-0.04358	-0.10673	0.07443	0.67759	-0.17842	0.22330
BYP	-0.39477	-0.08101	-0.08494	-0.02700	0.26340	0.05294	0.15191	-0.12248	-0.33844	0.35721	-0.38033
HI	0.42109	0.10552	0.08820	0.02965	-0.27498	-0.06099	-0.16691	0.13186	0.35526	-0.31899	0.42591

Residual are 0.09832; *, ** Significant at 0.05 and 0.01 level, respectively.
PH: Plant height, NTPP: Number of tillers per plant, EL: Ear length,EW: Eart weight, NG/E: Number of grains/ear GW/E: Grain weight/ear,
NG/S: Number of grains/Spikelets, NS/E: Number of Spikelets/ear, 100 GW: 100 grain weight, BYP: Biological yield per plant, HI:
Harvest index, GYP: Grain yield per plant.

The grain yield was significant and positively correlated with 100-grain weight, ear weight, grain weight per ear and number of grains per spikelet and it indicates that these three traits were main yield attributing traits. Similar association was observed by Tambe *et al*. (2013) for tillers per plant and 100 grain weight similarly; close resemblance was reported by Ali and Shakor (2012) for 1000-grain weight and for effective tillers per plant by Sharma *et al*. (2006) and for 1000 grain weight by Mhmood *et al*. (2006). Likewise, significant and positive association was observed between plant height and ear length; effective tillers per plant and ear weight; number of grains per ear and ear length; 100 grain weight and ear weight; biological yield per plant and ear length thereby indicating that these traits may be improved simultaneously.

The significant positive associations were also reported for biological yield with grains per spike Ahmadi *et al.* (2012); and 1000-grain weight with harvest index Ali and Shakor (2012). Traits viz., plant height, number of spikelets per ear and number of grains per ear had negative direct effect on

The combination of characters for path coefficient analysis were chosen basically on two criteria (I) The magnitude of correlation coefficients of different characters with grain yield plant and (II) the residual factor. In order to obtain developmental relations, the cause and effect relationship between yield and yield contributing characters were studied in wheat through path coefficient analysis.

Path coefficient analysis (Table 2) revealed that 100 grain weight had maximum direct effect on grain yield per plant followed by harvest index and biological yield which contributed equally to grain yield per plant. This indicates that, if other characters are held constant, improvement in these characters shall reflect in an increased grain yield. This is in accordance with the findings of Dharmendra and Singh (2010); Ali and Shakor (2012); Gelalcha and Hanchinal (2013); and Kumar *et al.* (2014). It was also observed that the highest negative direct effect was exerted by plant height followed by number of grains per spikelet and number of

spikelets per ear. Rangare *et al*. (2010) and Bhushan *et al*. (2013) reported that plant height has direct but negative effects on grain yield. Ear weight had maximum positive indirect effect via 100 grain weight); number of tillers per plant imposed positive indirect effect via100 grain weight, ear weight and harvest index; number of grains per spikelet and 100 grain weight; harvest index and 100 grain weight and number of grains per spikelet showed positive indirect effect by harvest index. The residual effect in path was only 0.098 and indicated that most of the grain yields contributing traits were included in this study.

Therefore, it can be concluded that in wheat, grain yield per plant was positively and significantly correlated with number of tillers per plant, ear weight and 100 grain weight. In path coefficient analysis, the highest positive direct effect was noted in 100 grain weight, harvest index and biological yield per plant. So, the trait like 100 grain weight showed positive correlation with yield as well as they have direct effect on yield. So, more emphasis should be given to these traits for genetic improvement of grain yield in wheat. Hence these traits can be used as selection indices in wheat to bring about the improvement in yield.

References

1. Ahmadi M., Farshadfar E. and Veisi S. 2012. Evaluation of genetic diversity in land races of bread wheat under irrigated and rainfed conditions. *Intl. J. Agri.* Crop Sci., 4**:** 1627-1636.
2. Ali I. H. and Shakor E. F. 2012. Heritability, variability, genetic correlation and path analysis for quantitative traits in durum and bread wheat under dry farming conditions. Mesoptamia *J. Agri.*, 40**:**27 - 39.
3. Ali Y., Atta B.M., Akhter J, Monneveux P. and Lateef Z. 2008. Genetic variability, association and diversity studies in wheat (*Triticum aestivum* L.) germplasm. *Pak. J. Bot*., 40: 2087-2097.
4. Bhushan B., Bharti S., Ojha A., Pandey M., Gourav S.S., Tyagi B. S. and Singh G. 2013.Genetic variability, correlation coefficient and path analysis of some quantitative traits in bread wheat. *J. Wheat* Res., **5**: 21-26.
5. Dharmendra S. and Singh K. N. 2010. Variability analysis for yield and yield attributes of bread wheat under salt affected condition. Wheat Information Service, 110**:** 35-39.
6. Dewey D.R. and Lu K.H. 1959. A correlation and path analysis of components of creasted wheat grass seed production. *Agron. J*., 51:515-518.
7. Gelalcha S. and Hanchinal R.R. 2013. Correlation and path analysis in yield and yield components in spring bread wheat (*Triticum aestivum* L.) genotypes under irrigated conditions in Southern India. *African J. Agri*. Res., **8**: 3186-3192.
8. Johnson H.W., Robinson H.F. and Comstock R.E. 1955. Estimates of genetic and environmental variability in soyabean. *Agron. J*., 4**7**: 314-318.
9. Khan M.H. and Dar A.N. 2010. Correlation and path coefficient analysis of some quantitative traits in wheat. *African Crop Sci. J*., 18: 9-14.
10. Tambe A., Mehta D.R., Chovatia, V.P. and Bhatiya V.J. 2013. Genetic variability, character association and path coefficient analysis in Durum Wheat (*Triticum durum* Desf.). *Electronic Journal of Plant Breeding*. 4: 1303-1308.
11. Tripathi S.N., Marker S., Pandey P., Jaiswal K.K. and Tiwari D.K. 2011. Relationship between some morphological and physiological traits with grain yield in bread wheat (*Triticum aestivum* L.). Trends Applied Sci. Res., **6:** 1037-1045.
12. Mhmood Q., Lei W., Qureshi A., Khan M., Hayat Y., Jilani G., Shamsi I., Tejammal M. and Khan M. 2006. Heterosis, correlation and path analysis of morphological and biochemical characters in wheat. *Agri. J*., 1:180-185.
13. Kumar Y., Lamba R.A.S. and Saharan R.P. 2014. Genetic variability for different biometric traits in wheat (*Triticum aestivum* L.) under medium fertility conditions. *Electronic Journal of Plant Breeding*, 5: 71-76.
14. Rangare N. R., Krupakar A., Kumar A. and Singh S. 2010. Character association and component analysis in wheat. *Electron. J. Plant Breed*. 1: 231-238.

****