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Association studies for grain yield and its contributing components in diverse genotypes of wheat (*Triticum aestivum* L. em. Thell)

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Abstract
Ninety four (Indigenous and exotic) genotypes were tested in Augumented Block Design at Nidhariya Agriculture farm S.M.M. TOWN P.G. College Ballia during *Rabi* 2017-18. The major objective was to study the correlation and path co-efficient analysis in wheat genotypes collected from different countries. The data were recorded on eleven quantitative traits namely days to 50% flowering, flag leaf area (cm^2), plant height (cm), spike length (cm), peduncle length (cm), tillers per plant, days to maturity, biological yield (g), harvest index, test weight (g) and grain yield/plant (g). The analysis of variance reviled highly significant differences between the genotypes under study. The data showed that the grain yield had significant and positive association with plant height (0.3820), peduncle length (0.7420), biological yield (0.9020), test weight (0.2711) and harvest index (0.5317)**.** Path coefficient analysis revealed that maximum positive direct contribution toward yield by biological yield (0.8573) and harvest index. The results revealed that these traits may serve as effective selection attribute during selection in breeding program for yield improvement in wheat.

Keywords: Wheat, (*Triticum aestivum* L), co-relation coefficient and path analysis

Introduction
Wheat (*Triticum aestivum*) is the world largest famous energy rich cereal crop. It covers 17% of the total cultivated land in the world. Wheat has been described as the king if cereals because of the acreage it occupies, high productivity and the prominent position it holds in the international food grain trade, It is a C_3 plant grown from temperate irrigated to dry and high rainfall areas and from warm humid to dry cold environment. Undoubtedly, this wide adaptation has been possible due to the complex nature of the plants genome which provides great plasticity to the crop. The world acreage under wheat crop during 2017-18 was 219.48 million hectare with production of 757.92 million metric ton with an average production 30.45 qt/hac (USDA 2018). In India the total area for wheat crop during 2017-18 30.79 million hectare with the production of 98.51 million metric ton and productivity was 30.20 qt/hac (USDA 2018). In crop plants the most of the traits are quantitative in nature. Grain yield is a complex trait and highly influenced by the action and interactions of various component characters (Grafius 1960) [6]**.** Correlation analysis is used as effective tools to determine the relationship among different trait in genetic diverse population for encashment of crop improvement process (Kandel *et al.*, 2018, Dhami *et al.*, 2018) [7, 3]. Correlation coefficient provides a better understanding of the different traits with grain yield. The study of association among various traits is useful to breeders in selecting genotypes possessing groups of desired traits. Path coefficient analysis provides a more information among variables. Path coefficient measures the magnitude of direct and indirect contribution of the components characters to a complex characters and it has been defined standardized regression coefficient which split the correlation coefficient in to direct and indirect effects. Path coefficient analysis has been used by plant breeders to assist in identifying traits that are useful as selection criteria to improve yield (Dewey and Lu 1959, Milligan *et al.*, 1990, Ahmed *et al.*, 2003) [2, 8, 1]. The objective of the study to find out correlation co-efficient among various characters, direct and indirect effects and yield components on grain yield by path coefficient analysis.

Material and method
The experimental materials comprised of ninety four (Indigenous and exotic) genotypes of wheat and four checks namely WR-544, SONALIKA, GW-366 and HD 3086. These genotypes exhibited wide spectrum of variability for various agronomical and morphological characters. The checks used in experiment were well adapted varieties of this resign, these entries were evaluated in Augumented Block Design (ARBD) in nine block and 14 plots in

each blocks (10 test genotypes and four checks) during *Rabi* 2017-18 at Nidhariya Agriculture Farm of Shri Murli Manohar Town Post Graduate College Ballia. The soil type of experimental field was sandy loam rich in potash and low in organic carbon, nitrogen and phosphorus with normal soil condition (pH =8.6, Ec =1.009). Each genotype was sown in 2.5 meters length, row to row spaced 30cm and intra row spacing of 5cm all recommended cultural practiced and plant protection measures were applied to raise to healthy crop.

The data were recorded on eleven quantitative traits namely days to 50% flowering, flag leaf area (cm^2), plant height (cm), spike length (cm), peduncle length (cm), tillers per plant, days to maturity, biological yield (g), harvest index (%), test weight (g) and grain yield/plant (g). From five randomly selected plants and days to 50% flowering and days to maturity were recorded on plot basis and all data were analyzed by standard statistical method.

Result and Discussion

The analysis of variance revealed highly significant differences among the genotypes for all the quantitative characters under study (Table-1). The estimation of simple correlation coefficient between eleven characters of exotic and indigenous germplasm of wheat under study is presented in table 2. The grain yield per plant showed highly significant and positive correlation at phenotypic level with plant height (0.3820), tillers per plant (0.7420), biological yield (0.9020), test weight (0.2761) and harvest index (0.5317). Thus, these characters come out as most important factors in influencing grain yield in wheat. These results are similar to those of Verma *et al.* 2019 [13]; Esmail 2001 [4]; Mohsin *et al.* 2009 [9] and Garg *et al.*, 2014 [5]. On the other hand, few quantitative traits were inter correlated with each other *viz.*, harvest index showed highly significant and positive correlation with tillers per plant (0.2562) and significant association with test weight (0.1941). Test weight exhibited highly significant and positive association with plant height, biological yield and grain yield. Biological yield exhibited highly significant and positive correlation with plant height, tillers per plant and grain yield. Tillers per plant exhibited highly significant positive correlation with plant height and grain yield. Plant height showed significant correlation days to 50% flowering and highly with grain yield. The above discussion revealed that all the highly significant estimates of correlation coefficient observed among the important yield components such as biological yield, tillers per plant, harvest index, plant height and test weight were highly significant and positive correlation with grain yield. Thus, selection practiced for improving these traits individually or simultaneously, is likely to bring improvement in other traits due to correlated response. This suggests that selection would be quit efficient in improving yield and these five yield components in wheat.

Path coefficient analysis was carried out by using simple correlation coefficient analysis presented in Table-3. Results revealed that biological yield had positive and significant association with grain yield which exerted maximum direct effect on grain yield followed by harvest index. This indicates actual relationship between these two traits with grain yield. These traits could be considered as important traits for selection in a breeding program for higher grain yield of the bread wheat. However, test weight and plant height had negative direct effect on grain yield while these characters showed positive significant association with grain yield which had very low. These results are relevant with the findings of Singh *et al.*, 2008 [12]*;* Mollasadeghi *et al.*, 2011 [10]*;* Sobit *et al.*, 2017 [11]. The highest positive indirect effect on grain yield was exerted by biological yield (0.6415) via tillers per plant followed by biological yield (0.3672) via plant height. The biological yield exerted considerable positive indirect effects on grain yield via biological yield. These characters emerged as most important indirect yield contributing characters because they showed substantial positive indirect effect towards grain yield. The remaining estimates of indirect effects in this analysis were very low indicating their importance indirect contribution towards grain yield. The existence of negative as well as positive direct and indirect effects by same characters on grain yield via one or other characters, simultaneously presents a complex situation where a compromise is needed to attain proper balance of different yield components in determining an ideotype for grain yield in wheat. Residual effects in the present study was 0.0917 which means the characters in the path analysis expressed the variability in the grain yield by 74.13 % and the remaining 9.17 needs additional characterization for the future breeding program. Further, it indicates that majority of the yield its contributing components have been studied.

Table 1: Analysis of variance of Augmented Block Design for 11 characters in wheat genotypes

S. No.	Characters/d.f	Source of variation		
		Blocks	checks	Error
		8	3	24
1	Days to 50% flowering	16.23**	18.56**	1.70
2	Flag leaf area(cm^2)	31.08**	85.34**	0.64
3	Plant height (cm)	115.10**	9.72**	1.41
4	Spike length(cm)	4.82**	1.36	0.08
5	Peduncle length (cm)	1.87	7.06**	0.10
6	Tillers per plant	2.73	4.37*	0.27
7	Days to maturity	16.56**	12.03**	1.30
8	Biological yield (g)	996.03**	1058.43**	14.17
9	Test weight (g)	38.58**	94.51**	1.46
10	Harvest index (%)	3.10*	35.42**	3.99
11	Grain yield (g)	141.78**	134.82**	6.58

*Significant at 5% probability level ** Significant at 1% probability level

Table 2: Estimates of simple correlation coefficients between 11 characters in wheat

Character		Days to 50% flowering	Flag leaf area (cm²)	Plant height (cm)	Spike length (cm)	Peduncle length (cm)	Tillers per plant	Days to maturity	Biological yield (gm)	Test weight (gm)	Harvest index (%)	Grain yield(gm)
Days to 50% flowering	r(g)	-0.0800	0.2718 **	-0.0871	0.1019	-0.0259	0.0936	-0.0488	-0.3633 **	-0.3656 **	-0.1615	
	r(p)	0.0301	0.1912 *	-0.1085	0.0284	0.1424	0.9793 **	0.0067	-0.2451 **	-0.0042	0.0008	
Flag leaf area (cm²)	r(g)		-0.1561	-0.3065 **	0.0463	-0.0690	-0.0232	0.0131	0.0750	-0.2227 *	-0.0501	
	r(p)		-0.1451	-0.2974 **	0.0245	-0.0412	0.0165	0.0177	0.0780	-0.1210	-0.0283	
Plant height (cm)	r(g)			-0.1175	0.1047	0.4220 **	0.2765 **	0.4699 **	0.3584 **	0.0439	0.4205 **	
	r(p)			-0.1035	0.1081	0.3311 **	0.1886 *	0.4283 **	0.3149 **	0.0667	0.3820 **	
Spike length (cm)	r(g)				0.0607	-0.0822	-0.0997	-0.1257	-0.0607	0.0173	-0.1223	
	r(p)				0.0805	-0.0891	-0.1051	-0.1343	-0.0552	0.0007	-0.1265	
Peduncle length (cm)	r(g)					-0.0532	0.0955	0.0288	0.0069	-0.1548	-0.0308	
	r(p)					-0.0450	0.0294	0.0283	0.0219	-0.1342	-0.0339	
Tillers per plant	r(g)						0.0265	0.8066 **	-0.0511	0.0482	0.7318 **	
	r(p)						0.1320	0.7483 **	-0.0337	0.2562 **	0.7420 **	
Days to maturity	r(g)							-0.0362	-0.3389 **	-0.3133 **	-0.1361	
	r(p)							0.0039	-0.2499 **	-0.0121	-0.0039	
Biological yield (gm)	r(g)								0.2404 **	0.1327	0.9343 **	
	r(p)								0.2366 **	0.1261	0.9020 **	
Test weight (gm)	r(g)									0.2198 **	0.2853 **	
	r(p)									0.1941 *	0.2761 **	
Harvest index (%)	r(g)										0.4647 **	
	r(p)										0.5317 **	

Significant Levels 0.05 0.01
If correlation r = 0.1749886 0.2286995

Table 3: Direct and indirect effects of 10 characters on grain yield per plant in wheat

No character	Days to 50% flowering	Flag leaf area (cm²)	Plant height (cm)	Spike length (cm)	Peduncle length (cm)	Tillers per plant	Days to maturity	Biological yield (gm)	Test weight (gm)	Harvest index (%)	Correlation with grain yield (gm)
Days to 50% Flowering	-0.0260	-0.0008	-0.0050	0.0028	-0.0007	-0.0037	-0.0255	-0.0002	0.0064	0.0001	0.0008
Flag Leaf Area (cm²)	0.0001	0.0041	-0.0006	-0.0012	0.0001	-0.0002	0.0001	0.0001	0.0003	-0.0005	-0.0283
Plant Height (cm)	-0.0016	0.0013	-0.0086	0.0009	-0.0009	-0.0029	-0.0016	-0.0037	-0.0027	-0.0006	0.3820
Spike Length (cm)	0.0014	0.0039	0.0013	-0.0130	-0.0010	0.0012	0.0014	0.0017	0.0007	0.0000	-0.1265
Peduncle Length (cm)	0.0000	0.0000	0.0001	0.0001	0.0012	-0.0001	0.0000	0.0000	0.0000	-0.0002	-0.0339
Tillers Per Plant	-0.0010	0.0003	-0.0023	0.0006	0.0003	-0.0069	-0.0009	-0.0051	0.0002	-0.0018	0.7420
Days to Maturity	0.0216	0.0004	0.0042	-0.0023	0.0006	0.0029	0.0221	0.0001	-0.0055	-0.0003	-0.0039
Biological Yield (gm)	0.0058	0.0152	0.3672	-0.1151	0.0243	0.6415	0.0034	0.8573	0.2028	0.1081	0.9020
Test Weight (gm)	0.0023	-0.0007	-0.0029	0.0005	-0.0002	0.0003	0.0023	-0.0022	-0.0093	-0.0018	0.2761
harvest Index (%)	-0.0018	-0.0518	0.0286	0.0003	-0.0575	0.1098	-0.0052	0.0540	0.0832	0.4286	0.5317

Residual factor = 0.0917
Bold figures indicate direct effects.

Conclusion

Correlation as well as path coefficient analysis indicated that biological yield, tillers per plant, harvest index, plant height and test weight were highly significant and positively correlate with grain yield and its components. Thus, it is suggested that during selection, these characters may be given due emphasis for developing high yielding varieties. Hence, emphasis should be given to select these traits for yield enhancement of wheat.

References

1. Ahmed HM, Khan BM, Khan S, Sadiq Kissana N, Laghari S. Path coefficient analysis in bread wheat. Asian J Plant Sci. 2003; 2:491-94.
2. Dewey SR, Lu KH. Correlation and path coefficient analysis of crested wheat gross seed production. Agron. J. 1959; 51:515-518.
3. Dhami NB, Kandel M, Gurung SB, Shrestha J. Agronomic performance and correlation analysis of finger millet genotypes (*Elusine coracana* L.). Malaysian J Sustain. Agric. 2018; 2:16-18.
4. Esmail RM. Correlation and path-coefficient analysis of some quantitative traits with grain yield in bread wheat (*Triticum aestivum* L.). Bulletin of the national Centre, Cairo. 2001; 26(3):395-408.
5. Garg P, Saharan RP, Chawla V, Gupta M. Correlation and path analysis fir yield and its components in wheat (*Triticum aestivum* L em. Thell.) under normal and drought conditions. Annals of Biology. 2014; 30(1):71-76.
6. Grafius JE. Does overdominance exist for yield in corn. Agron. J. 1960; 52:361.
7. Kandel M, Ghimire SK, Ojha BR, Shrestha J. Genetic diversity for heat tolerant related traits in maize inbred lines. Agriculture. 2018; 105:23-34.
8. Milligan SB, Gravois KA, Bischoff KP, Martin FA. Crop effect on genetic relationships among sugarcane traits. Crop Sci. 1990; 30:927-31.
9. Mohsin T, Khan N, Naqvi FN. Heritability, phenotypic correlation and path coefficient studies for some agronomic characters in synthetic elite lines of wheat. Journal of Food, Agriculture & Environment. 2009; 7(3/4):278-282.
10. Mollasadeghi V, R Shahryari. Important morphological markers for improvement of yield in bread wheat. Adv. Env. Biol. 2011; 5(3):538-542.

11. Sobit Z, Yadav Dr. B, Rai Dr. PK. Genetic variability correlation and path analysis for yield and its components in f5 generation of bread wheat (*Triticum aestivum* L.). Jour of Pharmacognosy and Phytochemistry. 2017; 6(4):680-687.
12. Singh SK, Singh BN, Singh PK, Sharma CL. Correlation and path analysis in some exotic lines in wheat (*Triticum aestivum* L.). Plant Archieves. 2008; 11(1):515-519.
13. Verma SP, VN Pathak, OP Verma. Interrelationship between Yield and its Contributing Traits in Wheat (*Triticum aestivum* L). Int. J Curr. Microbiol. App. Sci. 2019; 8(2):3209-3215.