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Short Communication

Correlation and path analysis for yield and yield contributing characters in wheat (*Triticum aestivum* L.)

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Correlation coefficients were determined in fifteen wheat genotypes for plant height, days to heading, days to maturity, 1000-kernel weight, spike length, number of tillers per plant, number of spikelets per spike and grain yield per plant. The result revealed that grain yield per plant was positively and highly significantly correlated with days to maturity but negatively and highly significantly associated with plant height. Days to maturity had highest positive direct effect on yield.

Key words: *Triticum aestivum*, yield contributing characters, path analysis, correlation.

INTRODUCTION

Wheat (*Triticum aestivum* L.) is an imperative rabi crop and main stable food source for world population. In Pakistan, wheat is grown on 8578.1 thousands hectares with an average yield of 2716 kg per hectare (Anonymous, 2007). This yield is far below than the most producing countries of the world due to water deficit conditions, high temperature and varying environmental conditions. Meeting this challenge will require efforts in multiple areas, one of which will be the development of high yielding varieties that are better adapted to wide range of environment. Both genotype and the environment affect grain yield and yield components of wheat. For that purpose, effective plant selection characters that are associated with yield are obligatory. Thus, study of correlation and direct and indirect effects of yield components provides the basis for successful breeding plan (Choudhry et al., 1986). The objective of this study was to determine the correlation and path analysis of yield and yield contributing characters in bread wheat and to assess their suitability in a breeding plan.

MATERIALS AND METHODS

The research was conducted in the research area of Wheat Research Institute, Ayub Agricultural Research Institute, Faisalabad (longitude 73° and 74° East, latitude 30° and 31.5° North, at an elevation of 605 feet above sea level) during two years (2007, 2008) under normal irrigation condition. Fifteen wheat lines/varieties were planted in randomized complete block design with three replications. Spacing between plants and rows was kept 9 and 30 cm, respectively. Throughout the season, appropriate control measures were utilized as needed for insect, pests and weed control; to raise healthy population.

At maturity ten guarded plants were randomly selected from each replication and data were collected for plant height, days to heading, days to maturity, 1000-grain weight, spike length, number of tillers per plant, number of spikelets per spike, and grain yield per plant. The data were statistically analyzed by using method of Steel et al. (1997). Genotypic and phenotypic correlation coefficients were determined according to Kwon and Torrie (1964). Path coefficient was calculated by the technique of Deway and Lu (1959).

RESULTS AND DISCUSSION

Correlation coefficients

The correlation between plant height and yield was observed negative and highly significant at both geno-typic and phenotypic level which indicates that selection of short stature genotypes may be effective for better grain yield. Similar results have been found by Saeed (1995), Khan et al. (2003) and Iqbal et al. (2007).

Days to heading showed negative association with yield at both genotypic and phenotypic levels. However, the associations were insignificant. Yildirm et al. (1996), Mondal et al. (1997), Narwal et al. (1999) and Ismail (2001) found similar results in their studies.

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Table 1. Genotypic (r_g) and phenotypic (r_p) correlation (upper values show r_g and lower values show r_p) among grain yield and different yield contributing characters in wheat.

Variable	GY	P.H	DH	DM	1000KW	S.L	TPP	SPS
GY	1							
	1							
P.H	-0.7688**	1						
	-0.6835**	1						
DH	-0.0989	0.3079	1					
	-0.0794	0.1412	1					
DM	0.6427**	-0.6518**	-0.3269**	1				
	0.4466	-0.4356	0.1033	1				
1000KW	0.0588	-0.1201	-0.329	0.471	1			
	0.0723	-0.0376	-0.2235	0.2543	1			
S.L	0.0488	-0.1606	-0.6704**	0.4125**	0.7471**	1		
	0.0652	-0.0346	-0.3338	0.0839	0.3863	1		
TPP	0.1504	-0.3509	0.0441	0.6667**	0.3414**	0.3471**	1	
	0.1209	-0.2169	0.0823	0.3252	0.2305	0.3283	1	
SPS	-0.2663	0.3316	-0.0718	0.1459	-0.153	-0.1274	0.1397	1
	-0.1938	0.2705	-0.1266	-0.0406	0.0428	-0.0384	0.1257	1

Grain Yield (GY), Plant Height (PH), Days to Heading (DH), Days to Maturity (DM), 1000 Kernel Weight (1000 KW), Spike Length (SL), Number of Tillers per Plant (TPP) and Number of Spikelets per Spike (SPS). **Significant at 1% level.

1000-kernel weight showed positive association with yield both at genotypic and phenotypic level. This result is in agreement with the results of Mondal et al. (1997), Dokuyucu and Akaya (1999), Mondal and Khajuria (2001) and Sarkar et al. (2002). 1000-kernel weight was also negatively, but insignificantly, correlated at both genotypic and phenotypic levels with plant height and days to heading. Similar results have been found by Shahid et al. (2002) and Saleem et al. (2006), who found that 1000-kernel weight was negatively and insignificantly correlated at genotypic and phenotypic levels with plant height.

The results depicted (Table 1) positive correlation between spike length and yield at both genotypic and phenotypic level. Kashif and Khaliq (2004) also reported similar findings. However, spike length showed highly significant and positive genotypic correlation with 1000-kernel weight. Saleem et al. (2006) found similar results in their study.

Number of tillers per plant was positively and highly significantly associated with days to maturity, 1000-kernel weight and spike length at genotypic level. Positive correlations among the traits were found on phenotypic level; however, the correlations were insignificant. Chowdhry et al. (2000) reported similar results. This finding indicated that number of tillers per plant may be an effective trait to select higher yielding genotypes.

Number of spikelets per spike was in negative relationship at both genotypic and phenotypic levels with yield and spike length. On the contrary, Kashif and Khaliq (2004) observed number of spikelets per spike as significantly and positively correlated with grain yield.

Path coefficient analysis

In this research, the response variable grain yield (GY) and seven predictor variables, plant height (PH), days to heading (DH), days to maturity (DM), 1000-kernel weight (1000 KW), spike length (SL), number of tillers per plant (TPP) and number of spikelets per spike(SPS), were studied for path coefficient (Table 2).

The highest positive direct effect on yield were exhibited by days to maturity (1.05) followed by days to heading (0.6741). Singhara (2005) observed the highest positive direct effect of days to maturity on yield. Plant height had negative direct effect on yield. Similar results had been reported by Mondal et al. (1997) and Ahmad et al. (2003). The highest positive indirect effects on yield were observed for number of tillers per plant, followed by 1000 kernel weight, both via days to maturity.

Conclusion

The study of correlation and path analysis of this experiment revealed that high plant height cause low yield due to its negative correlation with yield while days to maturity is the best selection parameter for breeding high yielding wheat cultivars due to its positively signify-cant genotypic association and highest direct effect on yield so that early maturing variety/line with moderate

Table 2. Direct and indirect effect of yield contributing characters on wheat yield (the last column shows genotypic correlation).

Variable	P.H	DH	DM	1000KW	S.L	TPP	SPS	GY(r_g)
P.H	(-0.4995)	0.2076	-0.6844	0.0557	-0.0959	0.2775	-0.0298	-0.7688
DH	-0.1538	(0.6741)	-0.3432	0.1525	-0.4001	-0.0349	0.0065	-0.0989
DM	0.3256	-0.2204	(1.05)	-0.2183	0.2462	-0.5274	-0.0131	0.6427
1000KW	0.06	-0.2218	0.4945	(-0.4634)	0.4459	-0.2701	0.0137	0.0588
S.L	0.0802	-0.452	0.4331	-0.3463	(0.5968)	-0.2746	0.0114	0.0488
TPP	0.1753	0.0298	0.7	-0.1582	0.2072	(-0.791)	-0.0125	0.1504
SPS	-0.1656	-0.0484	0.1532	0.0709	-0.076	-0.1105	(-0.0898)	-0.2663

Plant height (PH), Days to heading (DH), Days to maturity (DM), 1000 kernel weight (1000 KW), Spike length (SL), Number of tillers per plant (TPP), Number of spikelets per spike (SPS) and Grain yield (GY).

plant height give more yield comparative to late maturing variety and high plant height.

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