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Correlation and Path Coefficient Analysis in Common Wheat (*T. aestivum* L.)

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Correlation coefficients and path coefficients analysis were computed for yield components in 50 varieties of common wheat. The results indicated significant positive association of effective tillers/plant and spike length with grain yield/plant. Path coefficient analysis revealed that the number of effective tillers/plant and number of grains/spike were the main yield contributing components in wheat, whereas plant height and number of spiketets/spike contributed less to the grain yield. The results are thus, indicative that an improvement in yield potential may be brought about by making selection on the number of effective tillers/plant and number of grains/spike.

Improvement in grain yield is the sole aim of breeding for cereals. Further yield is the complex out come of certain components. These components singly or jointly contribute to the grain yield. Selection, therefore, based on yield itself would be misleading. Selection, has to be, therefore, employed on yield components. Thus, the information on nature and extent of association between character pairs would strengthern the selection programme aiming at the improvement in grain yield. Correlation coefficients, though provide information on the nature and extent of various associations yet don't furnish the information on cause and effect relationship. The path coefficient analysis is quite helpful in partioning the complex associations into direct and indirect effects. Such information in wheat are scanty.

Present study was undertaken on 50 common wheat varieties to study (1) correlation coefficients between yield and its components and among themselves at genotypic, phenotypic and error levels; (2) path coefficient analysis between yield components and the yield.

MATERIAL AND METHODS

Fifty varieties of indigenous and exotic origin of common wheat (*T. aestivum* L.) were field grown with three repeats during 1975-76 in I.C.A.R. Coordinated Research Project on "Use of Saline Water in Agriculture at R.B.S. College, Bichpuri, Agra. experimental sites. Each plot had 100 plants spaced 23 cm. between and 5 cm. within each row. Data on certain attributes, viz., plant height, effective tillers/plant, spike length, spikelets/spike, grains/spike, 1000 grain weight and yield/plant, were recorded from 10 randomly chosen plants/plot. Standard statistical procedures were used to analyse the recorded

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data. The correlation coefficients at the genotypic, phenotypic and error levels were estimated following Miller *et al.* (1958). The path coefficient analysis of yield/plant with six yield components was estimated according to the formula of Dewey and Lu (1959).

RESULTS AND DISCUSSION

Correlation coefficients : Results on correlation coefficients at the three levels, are presented in Table I. A persual of the data indicate that in general, the estimates of genotypic correlation coefficients were slightly higher than the corresponding phenotypic and error levels. This suggests that inspite o being strong inherant association bet ween the character pairs their expressio is reduced under the environmental in fluence. Johnson *et al.* (1953) and Kav and Menon (1972) have also reported similar observations in soybeans

At the genotypic level significan positive association of effective tiller with plant height, spike length, 100(grain weight; and yield/plant; of spik length with grains/spike and 1000 grai weight; and of grains/spike with spike lets/spike was realized. Whereas, the significant negative association of 100(

TABLE I. Genotypic, phenotypic and error correlation coefficients between yield and its component and among themselves in wheat

		Effective tillers/plant	Spike length	Spikelets/ spike	Grains/ spike	1000-grain weight	Yield/ plant
Plant height	G	+0.426**	−0.070	+0.031	+0.178	−0.009	−0.018
	P	+0.265	+0.002	+0.105	+0.145	−0.006	+0.011
	E	+0.203	+0.220	+0.300*	+0.172	+0.003	+0.189
Effective tillers/ plant	G	—	+0.329*	−0.140	−0.170	+0.294*	+0.539**
	P	—	+0.091	+0.011	+0.123	+0.097	+0.299*
	E	—	+0.005	+0.078	+0.255	−0.071	+0.130
Spike length	G	—	—	+0.082	+0.379**	+0.292*	+0.281*
	P	—	—	+0.185	+0.302*	+0.206	+0.140
	E	—	—	+0.267	+0.250	+0.074	−0.053
Spikelets/spike	G	—	—	—	+0.602**	−0.383**	+0.038
	P	—	—	—	+0.401**	−0.165	+0.006
	E	—	—	—	+0.074	+0.062	−0.030
Grains/spike	G	—	—	—	—	−0.409**	+0.153
	P	—	—	—	—	−0.220	+0.100
	E	—	—	—	—	−0.030	+0.053
1000-grain weight	G	—	—	—	—	—	+0.044
	P	—	—	—	—	—	+0.028
	E	—	—	—	—	—	−0.026

Significant (*) at 5% and Significant (**) at 1% level
G, P & E — Genotypic, Phenotypic & error levels.

grain weight spikelets/spike and grains/spike was observed.

At the phenotypic level, significant positive association was observed between effective tillers/plant and yield/plant; spike length and grains/spike; and spike and grains/spike.

At the error level, except a few associations, in general-all the character pairs showed non-significant association and thereby indicating low g x e interaction between the pairs studied. Results of Baker *et al.* (1968) are similar in wheat.

Observed significant positive association of yield/plant with effective tillers/plant and spike length are of great value in selecting high yielding genotypes. The results are in confirmty with those of Sikka and Jain (1958), Gandhi *et al.* (1964), Malik *et al.* (1968), Virk and Verma (1973); and Jaimini *et al.* (1974) in wheat. Very weak association of grain yield/plant with plant height and grains/spike observed in present investigation, have been reported by Virk and Verma (1973) and Kumar(1975) in wheat.

It is fair to conclude finally from the results on correlation coefficients that for selecting high yielding genotypes, selection based on effective tillers/plant and spike length would be quite rewarding.

Path Coefficient Analysis: Path values of genotypic levels showing the extent of direct and indirect influence of six yield components upon grain yield are presented in Table II. It is evident that tillers/plant and grains/spike had the highest (1.003 and 1.0686, respectively) direct positive effects on grain yield. In addition, 1000 grain weight also had positive direct (0.7000) effects on grain yield. Observation of Jaimini *et al.* (1974) for 1000 grain weight in wheat; Singh and Singh (1973) for tillers/plant; and Lenka and Misra (1973) for tillers/

TABLE II. Path coefficient analysis of genotypic correlation of six yield components with grain yield in common wheat

Correlated characters	Direct and indirect effect via						
	Plant height	Effective tillers/plant	Spike length	Spikelets/spike	Grains/spike	1000-grain weight	Correlation with yield/plant
Plant height	**—0.6204**	+0.4275	+0.512	—0.0036	0.902	-0.0630	—0.0188
Effective tillers/plant	—0.2643	**+1.0037**	—0.2409	+0.0164	—0.1816	+0.2058	+0.5397
Spike length	+0.0434	+0.3302	**—0.7324**	—0.0096	+0.4050	+0.2044	+0.2414
Spikelets/spike	—0.0112	—0.1405	—0.0600	**—0.1174**	+0.6433	—0.2681	+0.0365
Grains/spike	—0.1104	—0.1706	—0.2776	—0.0706	**+1.0686**	—0.2863	+0.1531
1000-grain weight	+0.0558	—0.2950	—0.2138	+0.449	—0.4370	**+0.7000**	+0.0445

Figures under lined denote direct effects
Residual effects — 0.15377

plant and grains/spike in rice are also similar and indicated direct positive effects of high magnitude of these attributes with grain yield.

No twithstanding, the direct positive effects of grains/spike with grain yield, their association was non-significant (Table I). Which might probably be due to the cancelling effects of the indirect negative influence of grains/spike via tillers/plant, spike length and grains/spike.

Negative effects of high magnitude of plant height with grain yield indicated that the yield potential could be increased by selecting short statured wheat varieties. Observations of Saini and Gangneja (1975) are in confirmity on plant height in rice.

Spike length which possessed significant positive association with grain yield, exhibited negative direct effect of high magnitude. On the other hand indirect positive effects of spike length via tillers/plant, grains/spike and 1000 grain weight were also considerable. It is, therefore, assumed that significant positive association of spike length with giain yield was mainly due to indirect positive influence via tillers / plant, grains/spike and 1000-grain weight.

It may finally be concluded from above findings and discussion that for increasing grain yield in wheat maximum stress is needed on increasing the num- of grains/spike and tillers/plant.

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