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# A Correlation and Path Coefficient Analysis for Some Yield Components in Bread Wheat

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**Abstract:** Correlation between some production traits were computed for 15 wheat varieties/lines. Path coefficient analysis were used to determine the direct and indirect effect of different characters on grain yield. A positive and significant correlation was observed between number of tillers per plant and peduncle length both at genotypic and phenotypic levels. There were highly significant correlation between spike length and grain yield per plant at phenotypic levels and positive significant at genotypic level. Path analysis showed that number of tillers per plant and spike length are the characters which contribute largely to grain yield.

**Key words:** Correlation, path-analysis, *Triticum aestivum* L., phenotypic level, genotypic level

## Introduction

Grain yield in wheat (*Triticum aestivum* L.) is a complex phenomenon as it is polygenically controlled. For effective selection, information on nature and magnitude of variation in population, association of character with yield and among themselves and the extent of environmental influence on the expression of these characters are necessary. In such situations, correlation and path coefficient analysis could be used as an important tool to bring information about appropriate cause and effects relationship between yield and some yield components. Singh and Singh (1999) reported positive correlation between number of tillers per plant and peduncle length. Baisak and Nayak (1991) observed positive correlation of peduncle length with grain yield. According to Gupta *et al.* (1999) there was positive correlation between spike length and grain yield. Khan *et al.* (1999) and Chowdhry *et al.* (2000) also conducted such studies and concluded that yield components like tillers per plant, grains per spike and 1000 grain weight are main contributors to grain yield in wheat. Narwal *et al.* (1999) concluded that tillers per plant have positive direct effect and indirect effect via plant height. Correlation and path coefficient analysis leads us to a clear understanding of the genetic association of various plant traits and their contribution to yield.

Keeping these facts in view the preset studies were conducted to have such valuable informations.

## Materials and Methods

The present investigations for correlation and path analysis studies of morphological traits of spring wheat (*Triticum aestivum* L.) were conducted in the experimental area of Department of Plant Breeding and Genetics, University of Agriculture, Faisalabad. The experimental material consists of fifteen varieties/lines of spring wheat i.e. FD-83, FD-85, Pb-85, Pb-96, Inqilab-91, Wattan, Ugab-2000, 4072, 4770, 4943, 5039, 6142, 6145, 6529-11 and 6544.6. These genotypes were planted in the field according to a randomized complete block design with three replications. There were three lines per genotype in each replication. Seeds were sown with the help of dibbler maintaining row to row distance of 30 cm and plant to plant distance of 15cm. All other agronomic practices were kept uniform. At maturity ten guarded plants per genotype from each replication were selected for recording of the data on the following characters:

1: Plant height (cm)
2: Number of tillers per plant
3: Peduncle length (cm)
4: Spike length (cm)
5: Grain yield per plant (g)

The analysis of variance and covariance for all above mentioned traits was performed following Steel and Torrie (1980). Correlation matrix was prepared using formulae developed by Kwon and Torrie (1964). Path coefficient analysis was done according to Dewey and Lu (1959).

## Result and Discussion

Mean differences among the genotypes for the most of the characters were highly significant but the plant height was significant (Table 1). This reflected a considerable diversity of varieties/lines for all plant characters studied. Genotypic correlation was higher than phenotypic correlation most of the cases (Table 2).

**Correlation:** The relationship between plant height with number of tillers per plant and peduncle length was observed positive but non significant both at genotypic and phenotypic levels. These findings are in good in

Table 1: Mean square values for different traits in bread wheat

Mean square values

| S.O.V | D.F. | Plant height | Number of tiller / Plant | Pdcuncle length | Spike length | Grainyield / plant |
|---|---|---|---|---|---|---|
| Replication | 2 | 1.722 | 0.058 | 3.128 | 0.688 | 0.175 |
| Genotypes | 14 | 1.283* | 0.759** | 15.231** | 1.639** | 0.143** |
| Error | 28 | 0.519 | 0.061 | 5.340 | 0.278 | 0.048 |

Mean Values

| Genotypes | Plant height (cm) | Number of tiller/Plant | Peduncle length (cm) | Spike length (cm) | Grainyield /plant (g) |
|---|---|---|---|---|---|
| FD-83 | 104.2abc | 10.70a | 48.70bcd | 10.63bcde | 17.60e |
| FD-85 | 103.9abc | 9.76bcd | 48.83bcd | 12.00a | 18.03abcd |
| Pb-85 | 102.8cd | 9.83bcd | 46.73d | 11.90a | 18.03abcd |
| Inqilab-91 | 103.4abcd | 9.53cd | 47.60cd | 9.70e | 17.67de |
| Pb-96 | 103.0bed | 10.93a | 52.70ab | 11.27ab | 18.20ab |
| Wattan | 103.4abcd | 9.66bcd | 50.90abcd | 10.07de | 18.00abcde |
| Uqab-2000 | 104.0abc | 10.97a | 55.23a | 11.13abc | 18.20ab |
| 4072 | 103.4abcd | 9.66bcd | 48.70bcd | 10.23cde | 18.10abc |
| 4770 | 104.1abc | 9.36d | 50.17bcd | 10.23cde | 17.87bcde |
| 4943 | 102.3d | 9.80bcd | 51.30abc | 11.20abc | 18.27ab |
| 5039 | 103.8abc | 10.00bc | 52.60ab | 10.10de | 17.93bcde |
| 6142 | 104.7a | 9.96bc | 51.73abc | 11.63a | 18.37a |
| 6145 | 103.3abcd | 10.07b | 49.67bcd | 11.00abcd | 18.07abcd |
| 6529-II | 104.3ab | 9.48d | 52.40ab | 9.90e | 17.73cde |
| 6544-6 | 104.4ab | 10.10b | 51.47abc | 10.53bcde | 17.97abcde |

Table 2: Phenotypic (P) and genotypic (G) correlation coefficients of some yield components in wheat

| Variable | | Number of tillers/plant | Peduncle length | Spike length | Grain yield per plant |
|---|---|---|---|---|---|
| Plant height | P | 0.0410ns | 0.2698ns | -0.1633ns | -0.2635ns |
| | G | 0.1327ns | 0.3873ns | -0.3805ns | -0.4144ns |
| Number of tillers/plant | P | | 0.4594* | 0.3503ns | 0.2387ns |
| | G | | 0.6193* | 0.4322ns | 0.3798ns |
| Peduncle length | P | | | -0.0580ns | 0.3898* |
| | G | | | -0.1155ns | 0.6177* |
| Spike length | P | | | | 0.6244** |
| | G | | | | 0.7991* |

*= Significant at 5% levels of probability, **= Highly significant at 1% levels of probability, ns= non significant

Table 3: Path coefficient and correlation coefficient analysis of grain yield per plant Vs different yield traits studied in Breed wheat

| Variables | Plant height | Number of tiller/ plant | Peduncle length | Spike length | correlation coefficient (rg) |
|---|---|---|---|---|---|
| Plant height | 2.67282 | 0.12982 | -1.3183 | 0.84362 | -0.4144 |
| Number of tillers/plant | 0.35456 | 0.97862 | -2.108 | -0.9582 | 0.37984 |
| Peduncle length | 1.03518 | 0.60606 | -3.4039 | 0.25605 | 0.61768 |
| Spike length | -1.0171 | 0.42297 | 0.39315 | -2.2169 | 0.79909 |

agreement with earlier results of Akbar *et al.* (1995), Nabi *et al.* (1998) and Chowdhry *et al.* (2000). On the other hand negative correlation was observed between plant height with spike length and grain yield per plant. Similar conclusions have also been drawn by Saeed (1995).

There was positive and significant correlation between number of tillers per plant and peduncle length both at genotypic and phenotypic levels (Singh and Singh 1999). Number of tillers per plant had positive but non-significant correlation with spike length and grain yield per plant both at genotypic and phenotypic levels. Peduncle length had negative correlation with spike length both at genotypic and phenotypic levels. Peduncle length had positive and significant correlation with grain yield per plant both at genotypic and phenotypic levels (Baisak and Nayak; 1991). A positive highly significant correlation of spike length with grain yield per plant at phenotypic level and positive significant correlation was observed at genotypic level. These results are in good agreement with the findings of Gupta *et al.* (1999) and Singh and Singh (1999.)

**Path coefficient analysis:** Direct effect of plant height on grain yield per plant was positive (Table 3). Plant height had positive indirect effects via number of tillers per plant and spike length while negative effects through peduncle length on grain yield per plant. Khan *et al.* (1999) also reported the similar type of results.

Direct effect of Number of tillers per plant on grain yield per plant was positive. The positive indirect effect was shown between number of tillers per plant and plant height and negative indirect effect via peduncle length and spike length on grain yield per plant (Narwal *et al.* 1999).

Direct effect of peduncle length on grain yield per plant was negative. Peduncle length had positive indirect effect via plant height, number of tillers per plant and spike length on grain yield per plant. Such kind of observations have also been reported by Shelembi *et al.* (1992).

Direct effect of spike length on grain yield per plant was negative. Spike length had negative indirect effect via plant height and positive indirect effect via number of tillers per plant and peduncle length on grain yield per plant. Similar trends for this trait were also observed by Shelembi *et al.* (1992).

From the present studies it could be concluded that grain yield per plant can be improved by selecting genotypes having more number of tillers and longer spike. These genotypes could be used to obtain different combinations of these traits for higher yielding segregants.

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