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Study of path coefficient analysis of some quantitative traits in wheat (*Triticum aestivum* L.)

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Abstract

The present investigation entitled “Study of Path Coefficient Analysis of some Quantitative Traits in Wheat (*Triticum aestivum* L.)” was undertaken to study the path coefficient analysis for grain yield and its components. A set of twenty genotypes of Wheat were evaluated over two years from 2015-16 to 2016-17 to assess the genetic analysis of these genotypes for yield and its contributing traits over years and environments. Experiment was conducted in randomized complete block with 3 replications and two dates of sowing i.e. 3rd week of November (timely sown) and 1st week of January (very late sown). In the study number of tillers plant⁻¹ showed highest positive direct effect on grain yield plant⁻¹, followed by biological yield plant⁻¹, harvest index, number of grains plant⁻¹, ear weight and number of spikelets ear⁻¹. It means direct selection of these traits may reward. However, days to maturity, plant height, days to 50% flowering, ear head length, peduncle length, 100 grain weight, number of ears plant⁻¹, number of grains ears⁻¹, number of dead tillers plant⁻¹ and number of effective tillers plant⁻¹ recorded negative direct effect on grain yield plant⁻¹. Greater part of indirect effects was recorded *via* other traits were only such traits viz., biological yield plant⁻¹, number of tillers plant⁻¹, number of effective tillers plant⁻¹/number of ears plant⁻¹, harvest Index, number of grains plant⁻¹, ear weight and number of spikelets ear⁻¹ having high to moderate positive indirect effects. This indicated that these were main contributors to the grain yield.

Keywords: Path coefficient analysis, direct and indirect effect on grain yield

Introduction

Wheat is one of the principal food crop in the world. Wheat is the main wintry weather cereal in India followed by rice. India had a remarkable achievement during Green revolution in wheat production and could increase productivity to the extent that it could bring itself out from insufficiency to a present self-sufficient status. Madhya Pradesh is the 3rd major producer state of wheat with 15.91 million tonnes from the 5.32 million hectares area (Anonymous, 2018) [1]. Wheat farming in Madhya Pradesh is characterized by the occurrence of high temperatures during the crop growing period. This is mainly due to the reality that big area of wheat (70%) is grown under rainfed conditions and only a little part of the growing time experiences the cool climate. The path coefficient analysis is a partial regression technique to partition the correlated responses into direct and indirect effects on yield, such information help to sustain the high yield levels of wheat for further useful work (Subhashchandra B. *et al.* 2009) [9]. Therefore, the present study was embarked on to find out the relationship between yield and its component characters and the cause-effect relation.

Materials and Methods

The experiment was carried out at Seed Breeding Farm, Department of Plant Breeding and Genetics, College of Agriculture Tikamgarh, Jawaharlal Nehru Krishi Vishwa Vidhyalaya, Jabalpur (M.P.) under irrigated timely and very late sown conditions. The trial area in use was quite homogeneous in respect of topography and fertility. The experimental material comprised of 20 promising genotypes of wheat, procured from different Wheat Improvement Projects, research centers was further analyzed of India viz., JW-3211, JW-3269, JW-3304, WH-147, GW-322, GW-273, GW-366, HI-1544, HI-8381, HI-8498, MP-1201, MP-1202, MP-1203, MP-1215, MP-3288, MP-4010, HD-2864, HD-2932, RAJ-3765, LOK-1. Experiment was grown in a Randomized Complete Block Design with three replications. Each plot consists of three rows of 2.5 m length and 22.5 cm apart under irrigated normal sown and

very late sown conditions during both experimental years. In experiment seventeen observations viz., Days to 50% flowering, Days to maturity, Plant height (cm), No. of tillers plant⁻¹, No. of effective tillers plant⁻¹, No. of dead tillers plant⁻¹, No. of spikelet's ear⁻¹, No. of ears plant⁻¹, No. of grains ear⁻¹, No. of grains plant⁻¹ Ear head length (cm), Ear weight (g), Peduncle length (cm), 100 grain weight (g), Biological yield plant⁻¹ (g), Yield plant⁻¹ (g), Harvest index (%) was recorded on 5 randomly selected plant from each plot. The path coefficient analysis was done as per Dewey and Lu (1959) [4]. Idea of path coefficient analysis is an important attribute of breeding programme.

Results and Discussion

In the present investigation, consisting varieties of different species of wheat has taken and their path analysis has done for finding direct and indirect effect of traits on yield. Path coefficient analysis is used to partition the relative contribution of yield components via standardized partial regression coefficients. It provides an effective way of finding out direct and indirect sources of correlation. Path coefficient analysis was carried out using genotypic and phenotypic correlation coefficients and pleasing grain yield as the dependent component in order to see the causal factor (s) and to identify the best components which are responsible for producing grain yield.

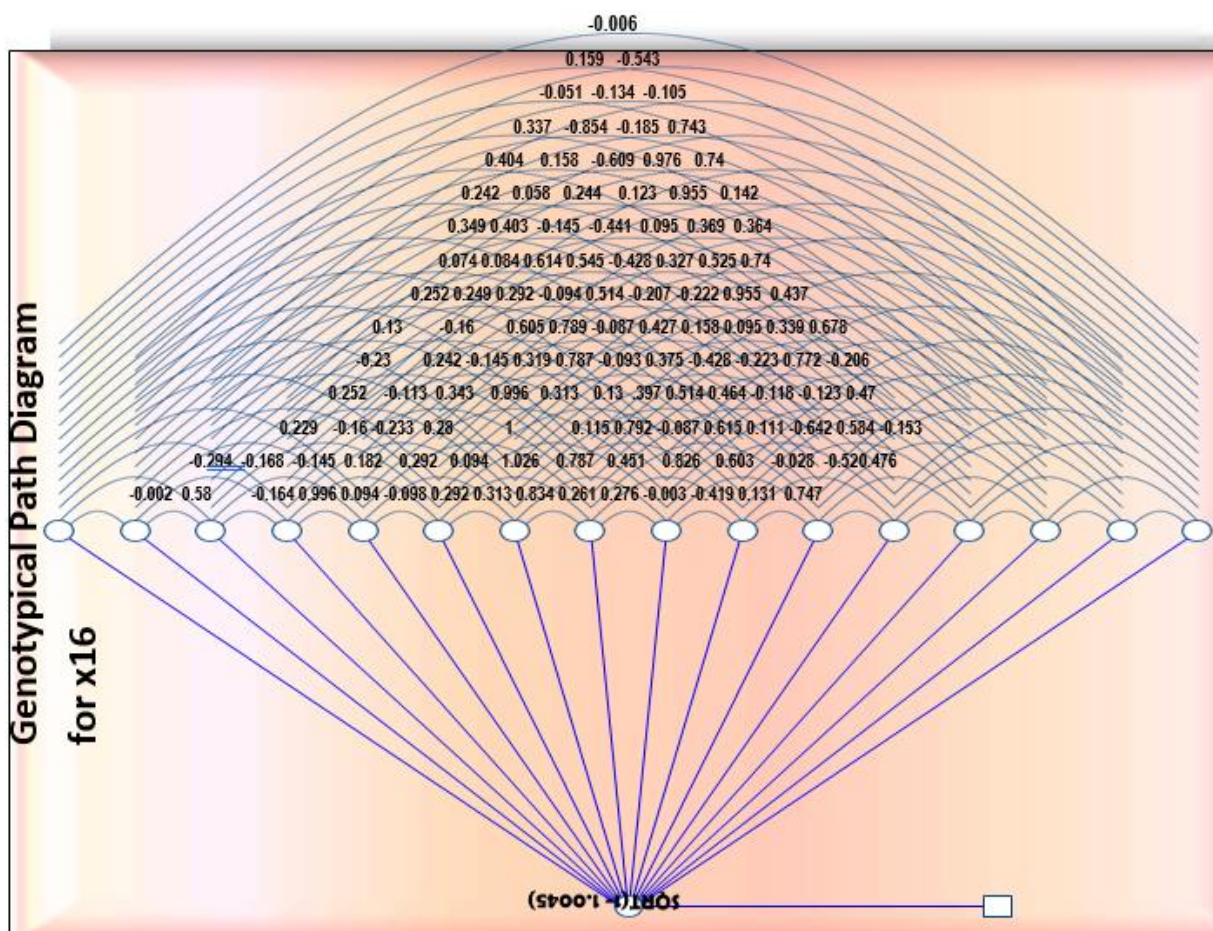
Path coefficient: In the present investigation number of tillers plant⁻¹ showed highest positive direct effect on grain yield plant⁻¹, followed by biological yield plant⁻¹, harvest index, number of grains plant⁻¹, ear weight and number of spikelets ear⁻¹. It means direct selection of these traits may reward; in

other words these traits should agreed importance while working selection, for improvement of grain yield in wheat. Similar results were recorded by Tsegaye *et al.* (2012) [10], and Kumar *et al.* (2016) [5].

However, days to maturity, plant height, days to 50% flowering, ear head length, peduncle length, 100 grain weight, number of ears plant⁻¹, number of grains ears⁻¹, number of dead tillers plant⁻¹ and number of effective tillers plant⁻¹ recorded negative direct effect on grain yield plant⁻¹. Similar result was reported by Shahidullah *et al.* (2017) [8] for days to 50% flowering and Kumar *et al.* (2019) [6] for ear length, number of ears plant⁻¹, number of productive tillars plant⁻¹ and days to 50% heading. Whereas, Deshmukh *et al.*, (2009) [3], showed same results for 1000 grain weight and Yagdi (2009) [11] for plant height. [Table-1, fig.-1]

Larger part of indirect effects, various independent traits *via* other traits were extremely little of either signs. There were only such traits viz., biological yield plant⁻¹, number of tillers plant⁻¹, number of effective tillers plant⁻¹/ number of ears plant⁻¹, harvest Index, number of grains plant⁻¹, ear weight and number of spikelets ear⁻¹ having high to moderate positive indirect effects.

The study on path coefficient concealed that the traits viz., number of tillers plant⁻¹, number of grains plant⁻¹, ear weight and harvest index showed positive and direct effect on grain yield plant⁻¹. Thus these traits might be considered for selecting the high yielding genotypes. Similar findings were studied by A. Harshal Avinashe (2015) [2], Shahidullah *et al.* (2017) [8], Rahul Singh (2018) [7], Kumar *et al.* (2019) [6]. Thus, path coefficient analysis can be used as an important tool to bring information about appropriate cause and effects relationship between yield and some yield components.



Genotypical Path Diagram for x16

Table 1: Path coefficient based on genotypic correlation coefficient. (Pooled)

| Traits | Days to 50% flowering | Days to maturity | Plant height (cm) | No. of tillers plant ⁻¹ | No. of effective tillers plant ⁻¹ | No. of dead tillers plant ⁻¹ | No. of Spikelet ear ⁻¹ | No. of Ears plant ⁻¹ | No. of Grains ear ⁻¹ | No. of Grains plant ⁻¹ | Ear head length (cm) | ear weight (g) | peduncle length (cm.) | 100 grain weight (g) | B Y P ⁻¹ (g) | HI (%) |
|--|-----------------------|------------------|-------------------|------------------------------------|--|---|-----------------------------------|---------------------------------|---------------------------------|-----------------------------------|----------------------|----------------|-----------------------|----------------------|-------------------------|---------|
| Days to 50% flowering | -0.0267 | 0.0001 | 0.0079 | -0.0061 | -0.0067 | 0.0061 | -0.0035 | -0.0067 | -0.0020 | -0.0093 | -0.0065 | -0.0108 | -0.0090 | 0.0014 | -0.0042 | 0.0002 |
| Days to maturity | 0.0000 | -0.0082 | -0.0048 | 0.0014 | 0.0013 | 0.0009 | -0.0020 | 0.0013 | -0.0020 | -0.0007 | -0.0033 | -0.0005 | -0.0013 | 0.0070 | 0.0011 | 0.0045 |
| Plant height (cm) | 0.0047 | -0.0092 | -0.0158 | 0.0026 | 0.0023 | 0.0037 | -0.0054 | 0.0023 | -0.0096 | -0.0046 | -0.0097 | 0.0023 | -0.0039 | 0.0096 | 0.0029 | 0.0017 |
| No. of Tillers plant ⁻¹ | 0.1638 | 0.1205 | 0.1173 | 0.7161 | 0.7133 | 0.1305 | 0.2003 | 0.7133 | 0.2283 | 0.5649 | -0.0673 | 0.3905 | -0.3159 | 0.0879 | 0.6992 | 0.5322 |
| No. of effective tillers plant ⁻¹ | 0.2142 | 0.1360 | 0.1230 | 0.8458 | -0.8491 | -0.0802 | -0.2480 | -0.8491 | -0.2654 | -0.6683 | 0.0737 | -0.4362 | 0.3635 | -0.0806 | -0.8113 | -0.6281 |
| No. of dead tillers plant ⁻¹ | 0.0306 | 0.0150 | 0.0311 | 0.0243 | 0.0126 | -0.1332 | 0.0130 | -0.0126 | -0.0153 | -0.0173 | 0.0124 | -0.0569 | 0.0275 | -0.0435 | -0.0492 | -0.0189 |
| No. of Spikelets ear ⁻¹ | 0.0058 | 0.0108 | 0.0153 | 0.0125 | 0.0130 | -0.0043 | 0.0445 | 0.0130 | 0.0457 | 0.0353 | 0.0177 | 0.0167 | 0.0070 | -0.0099 | 0.0234 | 0.0162 |
| No. of Ears plant ⁻¹ | 0.0047 | 0.0081 | 0.0244 | -0.0614 | -0.0612 | -0.0169 | 0.0351 | -0.0680 | 0.0137 | -0.0171 | 0.0001 | 0.0106 | 0.0107 | -0.0101 | -0.0334 | -0.0243 |
| No. of Grains ear ⁻¹ | -0.0093 | -0.0312 | -0.0759 | -0.0400 | -0.0392 | -0.0144 | -0.1285 | -0.0392 | -0.1253 | -0.1045 | -0.0565 | -0.0770 | -0.0582 | 0.0280 | -0.0425 | -0.0548 |
| No. of Grains plant ⁻¹ | 0.0581 | 0.0140 | 0.0486 | 0.1314 | 0.1311 | 0.0216 | 0.1319 | 0.1311 | 0.1390 | 0.1666 | 0.0435 | 0.1377 | 0.0185 | -0.0197 | 0.1286 | 0.1129 |
| Ear head length (cm) | -0.0113 | -0.0188 | -0.0286 | 0.0044 | 0.0040 | 0.0043 | -0.0185 | 0.0040 | -0.0210 | -0.0122 | -0.0466 | -0.0128 | -0.0281 | 0.0299 | 0.0057 | 0.0096 |
| ear weight (g) | 0.0453 | 0.0066 | -0.0163 | 0.0611 | 0.0575 | 0.0478 | 0.0420 | 0.0575 | 0.0688 | 0.0925 | 0.0309 | 0.1120 | -0.0003 | -0.0031 | 0.0654 | 0.0526 |
| peduncle length (cm.) | -0.0203 | -0.0095 | -0.0147 | 0.0266 | 0.0258 | 0.0125 | -0.0095 | 0.0258 | -0.0280 | -0.0067 | -0.0364 | 0.0002 | -0.0603 | 0.0253 | 0.0313 | 0.0093 |
| 100 grain weight (g) | 0.0032 | 0.0540 | 0.0385 | -0.0078 | -0.0060 | -0.0206 | 0.0141 | -0.0060 | 0.0141 | 0.0075 | 0.0405 | 0.0018 | 0.0265 | -0.0632 | -0.0083 | -0.0301 |
| B Y P ⁻¹ (g) | 0.0976 | -0.0824 | -0.1136 | 0.6003 | 0.5874 | 0.2270 | 0.3229 | 0.5874 | 0.2086 | 0.4747 | -0.0757 | 0.3590 | -0.3195 | 0.0803 | 0.6148 | 0.4590 |
| HI (%) | -0.0026 | -0.2263 | -0.0438 | 0.3095 | 0.3080 | 0.0591 | 0.1516 | 0.3080 | 0.1820 | 0.2823 | -0.0858 | 0.1956 | -0.0639 | 0.1983 | 0.3109 | 0.4164 |
| Yield plant ⁻¹ (g) | 0.1247 | -0.2696 | -0.1665 | 0.9419 | 0.9302 | 0.2608 | 0.5050 | 0.9302 | 0.4180 | 0.8002 | -0.1690 | 0.6215 | -0.4174 | 0.2475 | 0.9680 | 0.8827 |

B Y P⁻¹ (g) = Biological yield plant⁻¹ (g) HI (%) = Harvest index (%)

Partial R² -0.0033 0.0022 0.0026 0.6745 -0.7899 -0.0347 0.0225 0.0065 -0.0524 0.1333 0.0079 0.0696 0.0252 -0.0156 0.5951 0.3676

R SQUARE = 1.0045, RESIDUAL EFFECT = SQRT (1- 1.0045)

Conclusion

Biological yield plant⁻¹, harvest index, number of grains plant⁻¹, ear weight and number of spikelets ear⁻¹ revealed highest positive direct effect on yield plant⁻¹ were the main yield contributing traits, so it should be given more emphasis.

References

1. Anonymous, 2018. www.agricoop.nic.in.
2. Avinash Harshal A. Authentication of F1 Wheat Crosses and Genetic Analyses for Yield and Quality Attributes under Different Environments. Ph.D. thesis, 2015.
3. Deshmukh PB, Wankhade RS, Patil RK, Atale SB. Path analysis in durum wheat. *Journal Annals of Plant Physiology* 2009; 23(2):270-271.
4. Dewey DR, Lu KH. A correlation and path coefficient analysis of components of crested wheat grass seed production. *Agron. J.* 1959; 51:515-518.
5. Kumar Pradeep, Singh Gyanendra, Kumar Sarvan, Kumar Anuj, Ojha Ashish. Genetic analysis of grain yield and its contributing traits for their implications in improvement of bread wheat cultivars. *Journal of Applied and Natural Science.* 2016; 8(1):350-357.
6. Kumar Mandeep, Harshal Avinash, Nidhi Dubey, Simerjeet Kaur, Swapnil Kalubarme, Pranay Reddy *et al.* Heritability and correlation studies of yield and yield related traits in bread wheat (*Triticum aestivum* L.). *Journal of Pharmacognosy and Phytochemistry;* 2019; SP1:97-101.
7. Rahul Singh. Genetic analysis revealed that harvest index recorded high value of heritability and genetic advance, 2018.
8. Shahidullah Sapi, Marker Shailesh, Bhattacharjee Indranil. Correlation and path coefficient analysis of some quantitative traits in bread wheat. *Journal of Pharmacognosy and Phytochemistry.* 2017; 6(4):258-262.
9. Subhashchandra B, Lohithaswa HC, Desai SA, Hanchinal RR, Kalappanavar IK, Math KK *et al.* Assessment of genetic variability and relationship between genetic diversity and transgressive segregation in tetraploid wheat. *Karnataka J Agric. Res.* 2009; 22(1):36-38.
10. Tsegaye D, Dessalegn T, Dessalegn Y, Share G. Genetic variability, correlation and path analysis in durum wheat germplasm (*Triticum durum* Desf.). *Agricultural Research and Reviews.* 2012; 1(4):107-112.
11. Yagdi K. Path coefficient analysis of some yield components in durum wheat (*Triticum durum* Desf.) Pak. *J Bot.* 2009; 41(2):745-751.