Correlation and Path Coefficient Analysis of Wheat Genotypes under Late Sown Condition in Chhattisgarh Plains

Soni Lal Bhardwaj[1] Dr. P. K. Joshi[2]
[1,2]Department of Genetics & Plant Breeding
[1,2]Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Abstract— Correlation and path analysis was attempted for ten traits in wheat genotypes under late sown conditions. The magnitude of phenotypic correlation coefficient were higher as compared to the corresponding genotypic correlation coefficient which indicated the influence of environment in the expression of characters. Correlation coefficient analysis revealed positive for days to 50% flowering, days to maturity, plant height (cm), number of productive tiller/plant, spike lengh (cm), number of grains/spike, 1000 grain weight (g), biological yield/plot, harvest index (%) and grain yield/plot (g). Path analysis exhibited maximum positive direct effect of harvest index on grain yield/plot followed by days to maturity, biological yield/plot, number of grains/spike, plant height, days to 50% flowering, spike length, number of productive tiller/plant and 1000 grain weight. Genotypes HI 8737, HI 8727, MPO 1215, MP 3382 and HI 8725 were found to have better combination of various characters and yield in late sown condition.

Key words: Wheat, Correlation, Path Analysis

I. Introduction

Wheat (Triticum aestivum L.) is an important cereal crop. It has been described as the 'King of Cereals' because of the acreage it occupies, high productivity and the prominent position it holds in international food grain trade. The knowledge of association among the yield and yield contributing characters would be of great help in constructing a suitable plant type and in planning breeding programme. However, the correlation coefficient does not give any indication about comparative magnitude of contribution made by various component characters. Correlation studies provide better understanding of yield components which helps the plant breeder during selection (Johnson et al., 1955). Therefore, genotypic path coefficient analysis was carried out to find the direct and indirect effects of yield components and their correlation with grain yield per plot. Grain yield, a polygenic trait, is influenced by its various components directly as well as indirectly via other traits, which create a complex situation before a breeder for making selection. Therefore, path coefficient analysis could provide a more realistic picture of the interrelationship, as it considers direct as well as indirect effects of the variables by partitioning the correlation coefficient.

II. Materials & Methods

The present investigation was conducted during rabi season of 2013-2014 at the Instructional cum Research farm, College of Agriculture, Raipur, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh. The farm is situated at $17^0$14"N and $24^0$45"N latitudes and 84^0 15" E longitudes with an altitude of 289.60 meter above the mean sea level. The experimental materials consist of sixteen wheat genotypes were selected from Department of genetics and Plant breeding, College of Agriculture, Raipur CG (Table1.) The experiment was laid out in a randomized block design with four replications. The genotypes were sown in a plot of 10 rows each of 5 m length with row to row spacing 23 cm. Crops was provided with protective irrigations and recommended doses of fertilizers. Five competitive plants of each genotypes were randomly selected from each replication during appropriate physiological growth stage and data were recorded on 10 quantitative characters namely, days to 50% flowering, days to maturity, plant height (cm), number of productive tiller/plant, spike length (cm), number of grains/spike, 1000 grain weight (g), biological yield/plot, harvest index (%) and grain yield/plot (g). Correlation coefficient analysis carried out given by Miller (1958) and path analysis carried out developed by Wright (1921) and elaborated by Dewey and Lu (1959) and residual effect estimated by the method suggested by Singh and Chaudhary (1985).

III. Results & Discussion

The genotypic and phenotypic correlations were determined among grain yield and its components in all possible character combinations. Analysis of variance revealed that highly significant differences among the genotypes were observed for all the traits, which indicated the presence of good amount of genetic variability among the material studied. The results are presented in Table 2. Genotypic correlation coefficient were calculated for days to 50% flowering, days to maturity, plant height, number of productive tiller/plant, spike length, number of grains/spike, 1000-grain weight, biological yield/plot, grain yield/plot and harvest index. Days to 50% flowering exhibited significant positive correlation with days to maturity (0.79), harvest index (0.66) and number of productive tillers/ plant (0.30). Days to maturity showed significant positive correlation with number of productive tillers/plant (0.40) and harvest index (0.33) whereas; it exhibited significant negative correlation with plant height (-0.58), biological yield/plot (-0.66) and grain yield/ plot (-0.42). Plant height showed significant positive correlated with number of grains/spike (0.26), whereas; it exhibited negative significant correlation for number of tillers/plant (-0.46), harvest index (-0.70) and grain yield/plot (-0.30). Number of productive tillers/plant showed highly significant positive correlation with spike length (0.56), biological yield/plot (0.63) and grain yield/plot (0.64); while significant negative correlation observed with number of grains/spike (-0.29) only. Spike length showed significant positive correlation with biological yield/plot (0.65), harvest index (0.78) and grain yield/plot (0.96) whereas; negative and significant correlation observed with 1000-grain weight (-0.32).

Number of grains/spike exhibited significant positive correlation with harvest index (0.62) and grain yield/plot (0.51) whereas, significant negative correlation observed with 1000-grain weight (-0.31) and biological yield/plot (-0.51). Thousand grain weight exhibited significant positive correlation with biological yield/plot (0.25) whereas, significant negative correlation observed with harvest index (-0.52). Biological yield/plot exhibited significant positive correlation with grain yield/plot (0.70) and the harvest index revealed significant positive correlation with grain yield/plot (0.65). Positive correlation among the yield associated traits desirable for selection for breeding programmes. Similar finding were also reported by Sheikh and Singh (2001), Singh et al., (2003), Khalid et al (2011) Kumar et al., (2004), Khan and Dar (2010) Phenotypic correlations were analyzed between the yield and its components traits, the result were present in Table 2. Days to 50% flowering exhibited significant positive correlation with days to maturity (0.34). Days to maturity showed significant negative correlation with plant height (-0.04) and 1000-grain weight (-0.25). Number of productive tillers/plat exhibited significant positive correlation with spike length (0.38) and grain yield/plot (0.26) and the harvest index exhibited significant positive correlation with grain yield/plot (0.65). The similar finding are also reported by Patel and Monpara (2007) and Sakhare and Ghawat, (2011).

Path coefficient analysis partitioned the observed genotypic and phenotypic correlation between yield and its components into direct and indirect effects. The present investigation, path analysis was carried out by using genotypic correlation coefficient and taking grain yield/plot as dependent variable and rest of the yield attributing characters as the independent variables. Direct and indirect effects of yield attributing characters on grain yield are presented in Table 3.

Harvest index recorded the highest positive direct effect on grain yield/plot (0.523) followed by days to maturity (0.504), biological yield/plot (0.327), number of grains/spike (0.280), plant height (0.074) and days to 50% flowering (-0.253), spike length (-0.157), number of productive tillers/plant (-0.073) and 1000-grain weight (-0.014) negatively influenced grain yield/plot. The result suggests that due to positive direct effect and significant association with grain yield/plot, this trait may contribute for increased grain yield.

The indirect effects have been explained for only those characters which had shown significant correlation with grain yield. Days to 50% flowering exhibited positive indirect effect on grain yield through days to maturity (0.400), harvest index (0.343), spike length (0.029) and number of grains/spike (0.019) while negative indirect effects via biological yield/plot, number of productive tillers/plant and plant height. Days to maturity exhibited positive effect on grain yield through harvest index (0.176), spike length (0.023) and number of grains/spike (0.021) whereas, negative indirect effect via 50% flowering, biological yield/plot, plant height, number of productive tillers/plant and 1000-grain weight. Plant height exhibited positive indirect effect on grain yield through biological yield/plot (0.105), number of grains/spike(0.074), number of productive tillers/plant (0.034), days to 50% flowering (0.06), spike length (0.008) and least positive indirect effect via 1000-grain weight (0.0009) while, days to maturity and harvest index influenced the negative indirect effect. Number of productive tillers/plant showed positive indirect effect on grain yield via biological yield/plot (0.846), days to maturity (0.203), harvest index (0.103) and 1000-grain weight (0.0009) whereas, negative indirect effect via spike length, plant height, days to 50% flowering and number of grains/spike. Spike length exhibited positive indirect effect on grain yield through biological yield/plot (0.866), harvest index (0.412), days to 50% flowering (0.047) and1000-grain weight(0.004) while negatively indirect effects showed via number of productive tillers/plant, days to maturity, plant height and number of grains/spike. Number of grains/spike showed positive indirect effect on grain yield via harvest index (0.848), days to maturity (0.038), number of productive tillers/plant (0.021), plant height (0.019), spike length (0.005) and 1000-grain weight (0.004). Thousand grain weight showed positive indirect effect on grain yield through biological yield/plot (0.339), days to maturity (0.065), spike length (0.051) and number of productive tillers/plant (0.004) while biological yield/plot exhibited positive indirect effect on grain yield/plot through days to 50% flowering (0.057) and plant height. Harvest index showed positive indirect effect on grain yield through number of grains/spike (0.454), days to maturity (0.170) and 1000-grain weight (0.007). The residual effect of 0.2599 exhibited that all the character studied was sufficient to analyze their direct and indirect effects on grain yield. Present findings confirms the previous worker by Patel and Jain (2002), Handa et al.,(2004), Sahu et al., (2005), Khan and Dar (2010), Kumar et al., (2013), Fellahi et al., (2013), Verma et al., (2013), Rashidi et al., (2013) and Pandey et al., (2013). On the basis of above studies the characters which contributed maximum are days to 50% flowering, days to maturity, numbers of productive tillers/plant, biological yield and harvest index. Genotype HI8737, HI8727, MPO1215, MP3382 and HI 8725 were found to have better combination of above mentioned characters and also contributing maximum yield even in late sown and odd climatic conditions of Chhattisgarh.

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