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Correlation Coefficient Analysis Between Grain Yield and its Components in Corn (*Zea mays* L.) Hybrids

Majid Khayatnezhad, Roza Gholamin,
Shahzad Jamaati-e-Somarin and Rogayyeh Zabihi-e-Mahmoodabad

Young Researchers Club, Islamic Azad University, Ardabil Branch, Ardabil, Iran

Abstract: In order to study the correlation between some traits and yield components of corn and to determine the most effective factors on its yield, an experiment was carried out in randomized complete block design with four replications at the Station research Azad University Ardebil in 2009. In results parse vriance between genotypes significant difference level 0.01 percent observed that show richness genetically between varieties investigated found. Results parse solidarity show positive correlation meaningful between all traits Functioning had. So Most solidarity with yield, 100-weight showed (796 **). Results parse causality showed influence direct performance through 2 and greatest effect indirect through 100-weight upon kernel weight per ear were applied. Thus, these two traits can be attend in breeding programs and also be effective as potential traits in improving desired corn cultivars.

Key words: Correlation coefficient · Grain yield · Maize hybrid · Path analysis

INTRODUCTION

Maize crop plays an important role in the world economy and is valuable ingredient in manufactured items that affect a large proportion of the world population [1]. Correlation studied between yield and yield components and between yield components themselves is a prerequisite to plan a meaningful breeding program [2]. Path analysis has recently been studied in some crop by Alvi *et al.* [1], Carvalho *et al.* [3], Barbaro *et al.* [4] and Asghari-Zakaria *et al.* [5]. Several workers have attempted to determine linkage between the characters on which the selection for high yield can be made. Estimation of simple correlation between various agronomic characters may provide good information necessary for maize breeders, when, selection is based on two or more traits simultaneously. Information obtained from correlation coefficients for these characters could also be useful as indicators of the more important ones under consideration. The association among traits may be measured by genotypic and/ or phenotypic coefficients of correlation depending on the types of studied materials and the kind of experimental design used [6]. It is worthy to mention that the characters most responsible for variation plant yield (directly and indirectly) were in order of importance, LAI, blades area, ears dry weight/plant, number of kernels/ row, number of days to 50% of plant silking, ear length, ear diameter, plant height, 4th leaf area, 100 kernels weight, ear height and migration coefficient. Mohan *et al.* [7] studied path analysis on corn cultivars (169 cultivars) for grain yield and oil content and resulted that number of seed per row, 100 seed weight, Number of seed row and ear, Length had direct effect on grain yield and ear height, plant height and number of days until 50% Teaseling had most minus direct effect on grain yield. Our intention from this investigation. The direct and indirect effects of different quantitative traits on grain yield were studied in 90 hybrids by Geetha and Jayaraman [8] they reported that number of grains per row exerted a maximum direct effect on grain yield. Hence, selection of number of grains per row will be highly effective for improvement of grain yield. Kumar and Kumar [9] put emphasis on plant height with greater ear weight, number of seed rows per ear and number of seeds per ear for better grain yield. Mohammadi *et al.* [10] reported that 100-grain weight and total number of kernels per ear revealed highest direct effects on total grain weight ($p = 0.74$ and $p = 0.78$, respectively), while ear length, ear diameter, number of kernel rows and number of kernels per row were found to fit as second-order variables. Manivannan [11] found that ear diameter, kernel rows, 1000-grain weight, kernel row-1 and ear length had significant correlation with seed yield. Mani *et al.* [12] indicated that highly significant positive

Corresponding Author: Shahzad Jamaati-e-Somarin, Young Researchers Club, Islamic Azad University, Ardabil Branch, Ardabil, Iran, Tel: +989141594490, E-mail: jamaati_1361@yahoo.com.

correlation between grain yield plant^{-1} with all the other attributes. Devi *et al.* [13] reported that ear length, number of seed rows ear-1, number of seeds row^{-1} and 100-seed weight positively influenced the yield directly and also indirectly through several components. A review of the works of other researchers indicates that determining relationships between yield and its components has special importance. Although the results of all experiments were not in agreement with each other, but in the most experiments some yield components such as 100-kernel weight, kernel per row and kernel per ear has big importance in determining yield. Thus, by determining reaction of corn grain yield under nitrogen levels at different planting dates and recognition of the traits that has significant effect on yield, we can obtain great success in better programming of Agronomy management and breeding of progressive hybrids. Thus, the path coefficient analysis which measures the direct influence of one variable upon another and permits the separation of the simple correlation coefficient into components of direct and indirect effects was done.

MATERIALS AND METHODS

In order to selection of best hybrids of corn between 15 hybrids (Table 1), an experiment based on randomized complete block design with 4 replications was carried out in agricultural research station of Islamic Azad University, Ardabil branch, Ardabil, Iran. Experiments were conducted at the experimental field of Islamic Azad University of Ardabil, in Ardabil province (Northwest of Iran) in 2008-2009. Plots included 2 rows of corn with 6 m in each row. Distance between rows was 75 cm and between plants 20 cm. Traits included row per ear, kernel per row, kernel per ear, ear length, cob diameter, cob weight, kernel weight per ear, 100-kernel weight, plant height with tassel, cub dry weight, seed dry weight, yield. For analyzing test data from software MATATC, SPSS 16 was used and PATH2. Path analysis for performance based on characters remaining stepwise multivariate regression method was performed.

RESULTS AND DISCUSSION

Components of variance revealed a wide range of variability for all the characters. Variance arising due to differences among genotypes was highly significant for all the characters. Analysis of variance showed different between that all of traits between hybrids were significant. Except for number of seeds per ear, seed deep, ear diameter and cub dry weight traits phenotypic correlation coefficient showed that grain yield had highly significant and positive correlation with all of traits except cub diameter, ear height (P<1%). For separating of simple correlation coefficient between traits to direct and indirect effects with using of path analysis, grain yield used as depend variable and step wise regression analysis did.

The average yield of these cultivars (Fig. 1) showed that almost all cultivars had acceptable performance as the ninth highest figure and 8 had the lowest performance.

Simple correlation coefficients between studied traits illustrated in (Table 2) Results showed that 100-kernel weight has the most positive correlation (r=0.796**) with grain yield. After this traits, the seed dry weight and cob diameter showed the most correlation with grain yield (r=0.794** and r=0.744** respectively). High correlation of grain yield with the number of rows

Table 1: Correlation coefficients of studied traits

Traits name	Rows per ear	Kernels per row	Kernels per ear	Ear length	Cob diameter	Cob weight	Kernel weight per ear	100-kernel weight	Plant height	Yield
Row per ear	1									
Kernel per row	-0.134	1								
Kernel per ear	0.478**	0.774**	1							
Ear length	0.007	0.567**	0.497**	1						
Cob diameter	0.573**	-0.231	0.112	0.111	1					
Cob weight	0.415**	0.219	0.027	0.277	0.804**	1				
Kernel weight per ear	0.431**	-0.08	0.167	0.325*	0.701**	0.764**	1			
100-kernel weight	0.147	-0.597**	-0.432**	-0.107	0.573**	0.707**	0.711**	1		
Plant height	-0.097	0.117	0.124	-0.407*	0.397*	0.167	-0.167	0.137	1	
Yield	0.567**	0.413**	0.374**	0.473**	0.744**	0.411*	0.504**	0.796**	0.127	1

*, ** significant at 5% and 1%, respectively

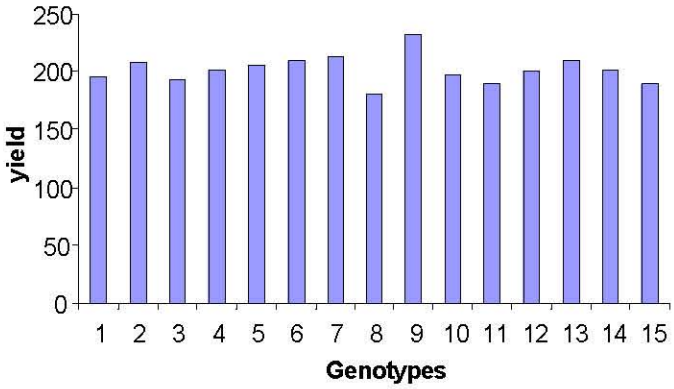

Fig. 1: Mean of genotypes yield

Table 2: Path analysis of 15 hybrids of corn for grain yield

		Indirect effect through								
Traits name	Direct effect	Rows per ear	Kernels per row	Kernels per ear	Ear length	Cob diameter	Cob weight	Kernel weight per ear	100-kernel weight	Plant height
Rows per ear	0.913	1	0.244	0.702	0.013	-1.431	0.741	-0.545	0.248	-0.135
Kernels per row	-1.82	-0.123	1	1.138	1.106	0.576	0.391	0.101	-1.012	0.162
Kernels per ear	1.47	0.436	-1.41	1	0.969	-0.28	0.048	-0.212	-0.732	0.171
Ear length	1.951	0.006	-1.033	0.73	1	-0.278	0.495	-0.411	-0.182	-0.564
Cob diameter	-2.497	0.523	0.42	0.164	0.216	1	1.437	-0.887	0.97	0.549
Cob weight	1.787	0.379	-0.399	0.039	0.54	-2.007	1	-0.966	1.197	0.231
Kernels weight per ear	-1.265	0.393	0.145	0.245	0.634	-1.75	1.365	1	1.204	-0.232
100-kernel weight	1.693	0.134	1.087	-0.636	-0.209	-1.431	1.264	-0.899	1	0.189
Plant height	1.384	-0.089	-0.214	0.182	-0.795	-0.991	0.298	0.211	0.232	1

per ear was reported by Corke and Kannenberg [14]; Mohammadi *et al.* [10]. Agrama [15] reported that the number of rows per ear has the greatest direct effect on grain yield. Increasing cob diameters caused an increase in the number of rows per ear and consequently increases in the number of rows per ear. In other words, grain yield with the cob diameters that caused the increase in kernel per ear, indicated positive and significant correlation. Consumption of 150 Kg nitrogen per hectare, by significant Increasing of cob weight, increased kernel per ear and also increased grain yield significantly. Between 100-kernel weight and cob weight was positive and significant correlation (r=0.411**). It seems that by increasing cob weight due to more absorption of photo assimilates, the most portion of assimilates remobilizes to grains, so the grain weight will increase. To study relationships between yield and its components multiple regression analysis (sequential path analysis) was used. Grain yield as dependent variable was 196 analyzed against other measured traits as independent variables and its results were illustrated in. Kernel per ear was a first rank variable in model and explained 76 percent of variation in grain yield. Grain length was the second variable in first rank that controls 54 percent grain yield variation. The results showed that kernels per ear justify more than half of grain yield variation and this may cover the other variables on grain yield. 100-kernel weight showed significant correlation with grain yield (Table 1). Cob weight, in spite of its positive and significant correlation with grain yield, has direct negative effect on kernel per ear (Table 2). In fact, the most part of the correlation between cob weight and grain yield is the result of indirect effect of this trait by kernel per row and the number of rows per ear on grain yield. 100-kernel weight had the most indirect effect by kernel weight per ear on grain yield (Table 2). Positive and significant correlation in the 0.01 percent level between all traits except plant height and cob weight was observed. The most direct positive effect on performance through ear lenght was applied. The least effect on yield was about cob diameter. On the whole the results of path analysis showed that kernel per ear have more importance in

selecting different traits of corn in yield. It is obvious that other variables will in the end have an effect on grain yield. The traits of kernel per row and grain length have more significant role on grain yield, so they must be considered in race developing to increase yield. Such results are reported by Agrama [15]. Nemati *et al*. [16] reported similar results.

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