Journal homepage www.jzs.univsul.edu.iq
Journal of Zankoy Sulaimani
Part-A- (Pure and Applied Sciences)

Correlation and path coefficient analysis in five inbred line of maize (*Zea mays* L.) and their F_1 and F_2 hybrids under different conditions using line × tester analysis

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Article info

Original: 07 Aug. 2015
Revised: 02 Dec. 2015
Accepted: 30 Jan. 2016
Published online: 20.06.2016

Key Words:

Zea mays L.; Correlation Analysis; Path Coefficient Analysis; Grain Yield

Abstract

This investigation was conducted on maize (*Zea mays* L.) at two environmentally different locations in Sulaimani, *viz.* Kanipanka and Qlyasan. The objective was to investigate the correlation between kernel yield and other agronomic characters and their direct and indirect effects on yield through path coefficient analysis. For the first generation at Kanipanka, correlation studies revealed significant positive relationship of kernel yield with number of rows/ear, while at Qlyasan, kernel yield had significant positive correlation with plant height number of kernels/row and kernel weight/row. For the second generation kernel yield/plant had highly significant correlation with most of the studied characters at both locations. For the first generation, the path analysis revealed that, number of ear/plant and number of kernel/row recorded the maximum positive direct effect in kernel yield/plant at Kanipanka and Qlyasan, while the maximum negative direct effect in kernel yield exhibited by plant height and number of ear/plant at Kanipanka and Qlyasan. The maximum positive indirect effect on kernel yield/plant recorded by number of ear/plant *via* plant height and the maximum negative indirect effect recorded by plant height *via* number of ear/plant at Kanipanka location, while at Qlyasan location number of kernel/row gave the maximum positive indirect effect *via* kernel weight/row and the maximum negative indirect effect recorded by number of ear/plant *via* kernel weight/row. For the second generation, the maximum positive direct effect in kernel yield recorded by number of ear/plant and plant height at Kanipanka and Qlyasan locations, while the maximum negative direct effect recorded by 300-kernel weight at both locations. The maximum positive indirect effect showed by number of ear/plant *via* number of rows/ear at Kanipanka location. At Qlyasan, the maximum positive indirect recorded by plant height *via* kernel weight/ear. The maximum negative indirect effect recorded by 300-kernel weight *via* plant height at both locations. These results detected that number of ear/plant, number of kernels/row and plant height may be used as reliable criteria for improving kernel yield in maize.

Introduction

Maize (*Zea mays* L.) is an important cereal and is the primary staple food for millions of people in many countries and it is one of the most important grown plants in the world. The very wide and variety utilization gave maize a superior position among the cereals. Maize had endless uses during centuries. It used as human food, livestock feed, for producing alcohol and no alcohol drinks, built material, like fuel, and like medical and ornamental plant ***[1]***.

Breeding for the high yield crops needs a lot of information on the nature and magnitude of variation in the obtainable materials, relationship of yield with other agronomic characters and the degree of environmental impact on the expression of these component characters. Maize grain yield has quantitative nature and polygenically controlled, effective yield improvement and concurrent improvement in yield components are essential ***[2]***. Selection on the basis of kernel yield character alone is not very successful and functional in general. However, selection based on its component characters could be more efficient and reliable ***[3]***. Correlation analyses are used to determine relationships between two characters, such that the values of two characters are analyzed on a paired basis, the results may be either positive or negative. A correlation result is of great value in the evaluation of the most effective procedures for selection of outstanding genotypes. When there is positive correlation of the major yield characters, component breeding would be very influential but when these characters are negatively correlated, it would be difficult to practice simultaneous selection for them in developing a variety ***[4]***. On the other hand, path coefficient analysis is a standardized regression coefficient that allows partitioning of correlation coefficient into direct and indirect effects of various characters towards dependent variable, and also helps in assessing the cause-effect relationship as well as an effective selection. Path coefficient analysis represents an important position in determining the degree of association between the yield and the other characters ***[5]***. Yield is consists of the contribution of several characters that are correlated among themselves and with the yield. The suggested path coefficient analysis of Wright (1921) and Dewey and Lu (1959), calculated to detect the relative importance of characters contributing to kernel yield ***[6]***.

Unlike the correlation coefficient analysis that measures the extent of relationship, path coefficient measures the magnitude of direct and indirect contribution of a component character to a complex character and it has been defined as a standardized regression coefficient which splits the correlation coefficient into direct and indirect effects ***[7]***. Determination of correlation and path coefficients between yield and other characters is important for the selection of superior genotypes for effective breeding programs in maize. Correlation coefficients in general represent associations among independent characteristics and the degree of linear relation between these characteristics. It is not adequate to describe this relationship when the causal association among characteristics is needed ***[8]***. Path analysis is used to determine the amount of direct and indirect effect of the causal components on the effect component and supplies more information among variables than do correlation coefficients sense this analysis provides the direct effects of specific characters on yield, and indirect effects *via* other characters ***[9]***.

The present study was destined to determine the specific characters that affects on kernel yield in two generation across two locations in Sulaimani to develop a suitable selection criterion for future maize breeding program.

Materials and Methods

Investigations were carried out at two environmentally different locations in Sulaimani, *viz.* Kanipanka Nursery Station, Sulaimani Agricultural Directorate, Ministry of Agriculture (Lat 35º 22'; N, Long 45º 43'; E, 550 masl) 35 Km east of Sulaimani city and Qlyasan Agricultural Research Station, Faculty of Agricultural Sciences, University of Sulaimani (Lat 35º 34' 307"; N, Long 45º 21' 992"; E, 765 masl), 2 Km north west of Sulaimani city.

Five inbreed lines of maize (*Zea mays* L.) namely (MSI 4218, MSI 4279, MSI 42100, ZP 434 and 5012) were received from the Ministry of Agriculture, Sulaimani Research Station, Bakrajo, Sulaimani, Iraq. The hybrids of the first filial generation were obtained during autumn 2009 at Qlyasan location, the F_1's were sown and selfed in the coming planting season (spring, 2010), to produce seed for F_2 generation at the same location. The hybridization consisted of two inbreed lines (MSI 4218 and MSI 4279) they were used as female parents (lines), together with three inbreed line (MSI 42100, ZP 434 and 5012) that were used as male parents (testers). The six cross hybrids for F_1's and F_2's with their five parents were evaluated during the growing season (spring 2011) following line × tester analysis.

Irrigation, fertilization, and weed control were accomplished according to standard field practices throughout the growing season. Hills were overplanted and thinned after emergence for a final plant density of about 55,000 plants/ha. Each cross was planted in four rows, 0.75 m apart and 5 m long with 0.25 m between plants on the row. At full maturity, the central two rows of each plot (excluding the boarders and 0.5 m the ends of each row) were harvested manually in both environments. Measurements were taken for five plants/plot on the following parameters: plant height (cm), number of ears/plant, number of rows/ear, number of kernels/row, number of kernels/ear, kernels weight/row (g), kernels weight/ear (g), 300-kernel weight (g), kernels yield/plant (g).

Correlation Analysis

The correlation coefficient was conducted to determine the degree of association of characters with yield and also among themselves in each environment. Phenotypic correlations were computed between characters in each environment by using the formula given by Singh and Chaudhary (1985) **[10]**.

Path Coefficient Analysis

The path coefficient analysis was carried out as suggested by Dewey and Lu (1959), Soomro (2010), Singh and Chaudhary (1985), Arbuckle (2009), through (Analysis of Moment Structures) AMOS Ver. 18 Software ***[11], [12]*** and ***[13]***.

Results and Discussion

According to Tables (1) and (2) which shows the character means under this study for the first and the second generations (F_1 and F_2) respectively, the correlation coefficients among the studied characters for the first generation at Kanipanka (upper values) and Qlyasan (lower values) locations are present in Table (3) and explaining the significance of these correlations.

Regarding Kanipanka location, highly significant positive correlation represents between number of ear/plant and plant height. Number of rows/ear correlated significantly and positively with plant height and number of ear/plant. There were significant and positive correlations between number of kernel/row and plant height.

Significant and positive correlation represents between kernel weight/ear and number of rows/ear. Kernel weight/plant recorded significant and positive correlation with number of ear/plant and kernel weight/ear, and correlated high significantly and positively with number of rows/ear.

At Qlyasan location, Significant and positive correlation represent between number of ear/plant and plant height. Number of rows/ear correlated significantly and positively with plant height. Highly significant and positive correlation was noticed between number of kernel/row and plant height. Kernel weight/row correlated high significantly and positively with plant height, Number of ear/plant and number of kernel/row. Kernel weight/ear correlated significantly and positively with number of ear/plant and number of kernel/row, while it correlated high significantly and positively with kernel weight/row. Significant and positive correlation coefficients were representing between 300-kernel weight with number of ear/plant and kernel weight/row. Kernel yield/plant correlated high significantly and positively with plant height, number of kernel/row and kernel weight/row, while correlated significantly and positively with number of rows/ear.

Table (4) represent the correlation coefficient among the studded character for second generation at Kanipanka (upper values) and Qlyasan (lower values) locations, which explain the significances of the correlation coefficient analysis among the characters.

Respecting Kanipanka location, highly significant and positive correlation was representing between number of ear/plant and plant height. Number of rows/ear correlated high significantly and positively with plant height and number of ear/plant. Highly significant and positive correlation was calculated between number of kernel/row and plant height, number of ear/plant and number of rows/ear. Kernel weight/row correlated positively and significantly with plant height, number of ear/plant and number of rows/ear, while it correlated high significantly and positively with number of kernel/row.

Tables-1: Means of the studied characters for the first generation (F_1) at Kanipanka (upper values) and Qlyasan (lower values) locations

Genotypes	Plant height (cm)	Number of ears/ plant	Number of rows/ ear	Number of kernels/ row	Kernel weight/ row (g)	Kernel weight/ ear (g)	300-kernel weight (g)	Kernel yield/plant (g)
MSI 4218 (1) × MSI 43100 (3)	211.112 209.261	2.461 1.739	17.747 17.867	26.422 41.719	6.333 12.168	92.583 161.417	95.216 91.052	139.936 204.758
MSI 4218 (1) × ZP 434 (4)	195.745 207.608	2.231 1.578	17.352 17.489	24.395 36.233	7.350 10.054	99.707 86.688	80.581 86.532	163.968 156.956
MSI 4218 (1) × 5012 (5)	200.603 213.838	2.039 1.739	18.536 17.047	26.893 42.419	7.217 12.232	105.981 192.206	78.406 91.778	125.056 186.374
MSI 4279 (2) × MSI 43100 (3)	233.774 206.261	2.641 1.651	17.847 18.183	35.276 38.153	8.000 10.235	86.715 132.437	75.581 81.304	150.255 189.226
MSI 4279 (2) × ZP 434 (4)	198.084 210.597	2.139 1.639	17.435 18.557	29.933 43.086	7.543 11.905	100.902 170.578	78.772 94.497	161.899 214.341
MSI 4279 (2) × 5012 (5)	196.112 205.540	2.185 1.578	17.904 19.224	34.535 44.107	8.312 11.983	125.032 173.751	79.589 71.223	187.149 179.160
MSI 4218 (1)	182.205 192.338	1.628 1.272	10.808 11.295	26.197 32.469	7.866 9.674	90.933 125.279	85.126 84.416	106.986 131.430
MSI 4279 (2)	177.855 194.178	1.685 1.190	14.270 18.525	23.475 30.596	8.469 8.258	84.612 113.440	76.502 68.872	124.048 125.610
MSI 43100 (3)	182.750 194.066	1.511 1.094	11.065 13.285	26.370 31.419	6.843 7.512	62.283 111.319	78.241 74.628	76.937 119.304
ZP 434 (4)	171.751 186.973	1.400 1.460	13.331 14.330	23.612 36.735	8.376 9.937	94.332 132.487	81.255 81.735	84.831 128.743
5012 (5)	191.916 200.454	1.148 0.856	15.669 16.698	32.784 40.364	8.428 9.178	89.523 90.252	80.668 73.667	124.287 181.665
Means of the genotypes	***194.719*** ***201.920***	***1.915*** ***1.436***	***15.633*** ***16.591***	***28.172*** ***37.936***	***7.703*** ***10.284***	***93.873*** ***135.441***	***80.903*** ***81.791***	***131.396*** ***165.233***

Tables-2: Means of the studied characters for the second generation (F_2) at Kanipanka (upper values) and Qlyasan (lower values) locations

Genotypes	Plant height (cm)	Number of ears/ plant	Number of rows/ ear	Number of kernels/ row	Kernel weight/ row (g)	Kernel weight/ ear (g)	300-kernel weight (g)	Kernel yield/plant (g)
MSI 4218 (1) × MSI 43100 (3)	193.444 188.996	1.640 1.800	13.724 14.667	18.226 35.579	4.646 10.084	65.911 143.446	87.087 92.169	112.255 184.147
MSI 4218 (1) × ZP 434 (4)	191.140 191.872	1.517 1.540	15.602 15.394	22.040 33.118	5.182 7.750	72.510 145.779	82.282 83.932	96.676 192.006
MSI 4218 (1) × 5012 (5)	194.384 194.772	1.313 1.318	13.562 17.648	25.113 23.151	7.702 6.271	109.205 135.283	92.286 86.855	114.517 147.079
MSI 4279 (2) × MSI 43100 (3)	188.267 187.804	1.603 1.552	14.084 13.364	24.866 25.539	6.580 6.394	80.571 112.813	87.459 82.376	115.033 144.607
MSI 4279 (2) × ZP 434 (4)	196.536 196.404	1.710 1.676	15.478 15.108	29.562 33.107	8.289 8.187	113.617 127.581	86.959 88.361	205.384 162.181
MSI 4279 (2) × 5012 (5)	189.371 189.889	1.510 1.752	16.380 17.025	22.111 34.439	5.796 8.702	98.493 159.188	83.198 87.688	99.189 194.787
MSI 4218 (1)	138.567 138.733	0.815 0.857	10.860 10.820	10.450 16.379	3.738 4.532	47.199 61.240	74.312 67.524	47.516 64.333
MSI 4279 (2)	136.956 137.289	0.840 0.933	8.907 12.364	11.018 20.240	3.847 5.132	42.733 86.344	71.106 65.498	43.836 87.627
MSI 43100 (3)	130.590 130.273	0.858 0.905	10.347 13.532	16.337 26.328	5.446 5.791	57.305 86.184	68.746 61.608	57.295 85.604
ZP 434 (4)	134.044 136.589	0.844 0.888	10.454 11.135	9.450 25.261	3.666 5.974	35.934 88.052	73.417 67.270	34.577 86.792
5012 (5)	140.064 140.022	0.819 0.898	10.939 12.547	19.240 24.359	4.488 4.702	64.866 77.610	62.630 60.474	64.398 77.387
Means of the genotypes	***166.6691*** ***66.604***	***1.224*** ***1.283***	***12.758*** ***13.964***	***18.947*** ***27.046***	***5.398*** ***6.684***	***71.668*** ***111.229***	***79.044*** ***76.705***	***90.062*** ***129.686***

Table-3: Pearson correlation coefficient analysis among the studied characters for the first generation (F_1) at Kanipanka (upper values) and Qlyasan (lower values) locations

Characters	Plant height (cm)	Number of ears/plant	Number of rows/ear	Number of kernels/row	Kernel weight/row (g)	Kernel weight/ear (g)	300-kernel weight (g)
Number of ears/plant	0.812** 0.642*						
Number of rows/ear	0.696* 0.669*	0.703* 0.430 n.s					
Number of kernels/row	0.635* 0.736**	0.304 n.s 0.545 n.s	0.446 n.s 0.582 n.s				
Kernel weight/row (g)	-0.294 n.s 0.740**	-0.405 n.s 0.814**	-0.129 n.s 0.482 n.s	0.261 n.s 0.876**			
Kernel weight/ear (g)	0.157 n.s 0.517 n.s	0.363 n.s 0.701*	0.642* 0.310 n.s	0.316 n.s 0.661*	0.240 n.s 0.814**		
300-kernel weight (g)	0.052 n.s 0.553 n.s	0.141 n.s 0.678*	0.005 n.s 0.005 n.s	-0.243 n.s 0.420 n.s	-0.539 n.s 0.643*	0.055 n.s 0.461 n.s	
Kernel yield/plant (g)	0.555 n.s 0.861**	0.691* 0.550 n.s	0.796** 0.651*	0.533 n.s 0.881**	0.064 n.s 0.796**	0.729* 0.545 n.s	-0.028 n.s 0.541 n.s

There were highly significant and positive correlation between Kernel weight/ear and each of the characters plant height, number of ear/plant, number of rows/ear, number of kernel/row and kernel weight/row. 300-kernel weight correlated highly significant and positively with plant height, number of ear/plant and number of rows/ear, while it correlated significantly and positively with number of kernel/row, kernel weight/row and kernel weight/ear. Highly significant and positive correlations were represent between kernel yield/plant and each of plant height, number of ear/plant, number of rows/ear, number of kernel/row, kernel weight/row and kernel weight/ear, while it correlated significantly and positively with 300-kernel weight.

At Qlyasan location, number of ears/plant had highly significant and positive correlation with plant height. Highly significant and positive correlations were noticed between number of rows/ear with plant height and eras/plant. There were significant and positive correlation between number of kernel/row with plant height, number of ears/plant and number of rows/ear. Highly significant and positive correlation was recorded for kernel weight/row with each of plant height, number of ears/plant and number of kernel/row, while significant and positive correlation was presented between kernel weight/row and number of rows/ear. Highly significant and positive correlations were observed for kernel weight/ear with plant height, number of ears/plant, number of rows/ear, number of kernel/row and kernel weight/row. Highly significant and positive correltion was observed for 300-kernel weight with plant height, number of ears/plant, number of rows/ear, kernel weight/row and kernel weight/ear, but it had significant and positive correlation with number of kernel/row. Kernel yield/plant was recorded high significant and positive correlation coefficient with plant height, number of ears/plant, number of rows/ear, number of kernel/row, kernel weight/row, kernel weight/ear and 300-kernel weight. These results were similar with the findings of Tyagi *et al.* (1988); Singh *et al.* (1991); Khakim *et al.* (1998); Firoza *et al.* (1999); Sumathi *et al.* (2005); Sofi and Rather (2007) ***[14], [15], [16], [17], [18],*** and ***[19].***

Table-4: Pearson correlation coefficient analysis among the studied characters for the second generation (F_2) at Kanipanka (upper values) and Qlyasan (lower values) locations

Characters	Plant height (cm)	Number of ears/plant	Number of rows/ear	Number of kernels/row	Kernel weight/row (g)	Kernel weight/ear (g)	300-kernel weight (g)
Number of ears/plant	0.961** 0.930 **						
Number of rows/ear	0.916** 0.807**	0.909** 0.7.22 **					
Number of kernels/row	0.827** 0.666*	0.801** 0.828 **	0.804** 0.606*				
Kernel weight/row (g)	0.712* 0.757**	0.672* 0.909 **	0.649* 0.628*	0.916** 0.923**			
Kernel weight/ear (g)	0.818** 0.897**	0.741** 0.912 **	0.800** 0.882**	0.935** 0.826**	0.928** 0.872**		
300-kernel weight (g)	0.909** 0.964**	0.857** 0.947**	0.759** 0.757**	0.658* 0.693*	0.689* 0.852**	0.713* 0.902**	
Kernel yield/plant (g)	0.823** 0.923**	0.850** 0.958 **	0.765** 0.809**	0.893** 0.850**	0.863** 0.896**	0.861** 0.980**	0.719* 0.925**

Data in Table (5) explain the path coefficient analysis through direct effect (diagonal values) and indirect effect at Kanipanka location (upper values) at Qlyasan location (lower values) on kernel yield/plant for the first generation.

At Kanipanka location, the maximum positive direct effect on kernel yield/plant was recorded by number of ear/plant with 0.956 and followed by number of rows/ear recording 0.636, while the maximum negative direct effect recorded by plant height with -0.981. The maximum positive indirect effect on kernel yield/plant recorded by number of ear/plant *via* plant height (0.776) followed by 0.672 recorded by number of ear/plant *via* number of rows/ear. The maximum negative indirect effect was -0.796 recorded by plant height *via* number of ear/plant followed by -0.683 recorded by plant height *via* number of rows/ear.

Regarding Qlyasan location, it was observed that number of kernel/row recorded the maximum positive direct effect in kernel yield/plant with 0.528, while the maximum negative direct effect exhibited by Number of ear/plant with -0.259. Concerning the indirect effects, number of kernel/row gave the maximum positive in direct effect value *via* kernel weight/row with 0.462 followed by 0.388 as recorded by number of kernel/row *via* plant height. The maximum negative indirect effect value recorded by number of ear/plant *via* kernel weight/row with -0.211 followed by -0.182 for number of ear/plant also *via* kernel weight/ear.

Table (6) explains the direct and indirect effect of the characters in kernel yield for the second generations at both locations.

At Kanipanka location, the maximum positive direct effect value was 1.149 recorded by number of ear/plant, while the maximum negative direct effect value was -0.770 recorded by 300-kernel weight. The maximum positive indirect effect showed by number of ear/plant *via* number of rows/ear with 1.044 and the maximum negative in direct effect was -0.700 recorded by 300-kenel weight *via* plant height for F_2 generation at Kanipanka location.

Respecting Qlyasan location, the maximum positive direct effect recorded by kernel weight/ear with 0.867, whereas the maximum negative direct value was -0.747 recorded by 300-kenel weight. The maximum positive indirect effect was 0.791 recorded by kernel weight/ear *via* number of ear/plant and the maximum negative indirect effect value was -0.720 recorded by 300-kernel weight *via* plant height. These results were in a good agreement with the findings of Sumathi *et al.*, (2005); Xie-Zhen *et al.*, (2007) ; Mohammad *et al.*, (2008) and Vaezi *et al.*, (2000) ***[18], [20], [21]*** and ***[22]***.

Table-5: Path coefficient analysis confirming direct (diagonal values) and indirect effects on Kernels yield/plant for the first generation (F_1) at Kanipanka (upper values) and Qlyasan (lower values) locations.

Characters	Plant height (cm)	Number of ears/plant	Number of rows/ear	Number of kernels/row	Kernel weight/row (g)	Kernel weight/ear (g)	300-kernel weight (g)
Plant height (cm)	**-0.981** **0.257**	-0.796 0.165	-0.683 0.172	-0.623 0.189	0.288 0.190	-0.154 0.133	-0.051 0.142
Number of ears/plant	0.776 -0.166	**0.956** **-0.259**	0.672 -0.111	0.291 -0.141	-0.387 -0.211	0.347 -0.182	0.135 -0.176
Number of rows/ear	0.443 0.196	0.447 0.126	**0.636** **0.292**	0.284 0.170	-0.082 0.141	0.408 0.091	0.003 0.001
Number of kernels/row	0.383 0.388	0.183 0.287	0.269 0.307	**0.603** **0.528**	0.157 0.462	0.191 0.349	-0.146 0.222
Kernel weight/row (g)	-0.056 -0.020	-0.077 -0.022	-0.024 -0.013	0.050 -0.024	**0.190** **-0.027**	0.046 -0.022	-0.102 -0.017
Kernel weight/ear (g)	-0.018 0.004	-0.042 0.006	-0.074 0.003	-0.036 0.005	-0.028 0.007	**-0.115** **0.008**	-0.006 0.004
300-kernel weight (g)	0.007 0.201	0.020 0.247	0.001 0.002	-0.034 0.153	-0.075 0.234	0.008 0.168	**0.140** **0.364**
Correlation Kernel yield/plant	***0.555 n.s*** ***0.861*****	***0.691**** ***0.550 n.s***	***0.796***** ***0.651****	***0.533 n.s*** ***0.881*****	***0.064 n.s*** ***0.796*****	***0.729**** ***0.545 n.s***	***-0.028 n.s*** ***0.541 n.s***

Table-6: Path coefficient analysis confirming direct (diagonal values) and indirect effects on Kernels yield/plant for the second generation (F_2) at Kanipanka (upper values) and Qlyasan (lower values) locations.

Characters	Plant height (cm)	Number of ears/plant	Number of rows/ear	Number of kernels/row	Kernel weight/row (g)	Kernel weight/ear (g)	300-kernel weight (g)
Plant height (cm)	**0.438** **0.713**	0.421 0.663	0.401 0.575	0.362 0.475	0.312 0.540	0.358 0.640	0.398 0.687
Number of ears/plant	1.104 0.141	**1.149** **0.151**	1.044 0.109	0.920 0.125	0.772 0.137	0.851 0.138	0.985 0.143
Number of rows/ear	-0.328 -0.174	-0.325 -0.156	**-0.358** **-0.216**	-0.288 -0.131	-0.232 -0.136	-0.286 -0.191	-0.272 -0.164
Number of kernels/row	-0.613 -0.160	-0.594 -0.198	-0.596 -0.145	**-0.741** **-0.240**	-0.679 -0.221	-0.693 -0.198	-0.488 -0.166
Kernel weight/row (g)	0.650 0.345	0.613 0.415	0.592 0.287	0.835 0.421	**0.912** **0.456**	0.846 0.398	0.628 0.389
Kernel weight/ear (g)	0.273 0.778	0.247 0.791	0.266 0.764	0.311 0.717	0.309 0.756	**0.333** **0.867**	0.237 0.783
300-kernel weight (g)	-0.700 -0.720	-0.660 -0.707	-0.584 -0.566	-0.506 -0.518	-0.530 -0.636	-0.549 -0.674	**-0.770** **-0.747**
Correlation Kernel yield/plant	***0.823***** ***0.923*****	***0.850***** ***0.958 *****	***0.765***** ***0.809*****	***0.893***** ***0.850*****	***0.863***** ***0.896*****	***0.861***** ***0.980*****	***0.719**** ***0.925*****

Conclusion

There is evidence to show that selection directly for kernel yield or that make a significant contribution to yielding potency would be useful in improving of yield. Partitioning the correlation coefficient of yield components with kernel yield into direct and indirect effects will help to assessment the actual contribution of a characteristic and its effect through other characters.

Based on the results expressing characters correlation and path coefficient for yield and yield contributing characters, breeders should be interest to characters like number of ears/plant, number of kernels/row and plant height, making selection of high yielding genotypes in maize, which can be kept as the selection characters.

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