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## Correlation and path coefficient analysis of quantitative traits in maize (*Zea mays* L.)

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### Abstract

The present investigation was carried out with 238 genotypes that were grown in Randomized Complete Block Design (RCBD) with three replications to assess correlation and path coefficients during *Rabi* 2020. Correlation analysis revealed that kernel yield per plant found a significant positive association with cob weight, cob length, cobs per plant, cob girth and kernel per row. Path analysis showed that days to 50% tasseling, cobs per plant, cob weight, cob length, kernel row per cob and cob girth were the major characters having positive direct effects and significant association with kernel yield per plant. Further, the characters *viz.*, cobs per plant and cob weight had a true relationship with kernel yield per plant. Path coefficient analysis can be an effective technique to identify the yield attributes in maize.

**Keywords:** Maize, genotypic correlation, phenotypic correlation, path coefficient, kernel yield

### 1. Introduction

Maize (*Zea mays* L.) is the world's most extensively grown crop and an important cereal crop next to rice and wheat. Because of its tremendous yield potential and versatility have earned the epithet "Queen of Cereals". It is an essential food, feed, and industrial raw resource for billions of people worldwide. Broadly, over 170 countries produce nearly 1,147.7 million metric tons (MT) of maize in an area of 193.7 million hectare, with average productivity of 5.75 t/ha (FAOSTAT, 2020)<sup>[7]</sup>. It has risen to the status of an industrial crop around the globe, with 83 per cent of its production going to the feed, starch, and biofuel industries. Furthermore, maize is used to make over 3000 products, both directly and indirectly, providing a diverse range of value-added options. Due to its numerous applications, it is a major driver of the global agricultural economy.

Among the maize-growing countries, India ranks 4<sup>th</sup> in area and 7<sup>th</sup> in production, representing around 4 per cent of the world maize area and 2 per cent of total production. Indian Maize is performing comparatively low in terms of yield as compared to the world average. The current data seeks to capture the yield comparison of most of the major maize-producing countries. The difference in yield between India and world yield for maize is huge and works out to roughly 130 per cent. The difference in yield among the leaders in maize production is even much larger, indicating huge amount of effort is required in improving the yield and total production of maize in India. In India, a large part of the maize area is either under low-yielding composites or traditional varieties or hybrids are not performing well in these regions. This low-yielding situation calls for rapid hybridization, as hybridization directly and positively correlates with yield enhancement.

Grain yield in maize is a complex character controlled by many factors. Selection for desirable genotypes is done based on grain yield and its associated component characters. To determine such relationships, correlation analysis is used. The result of the correlation is of great value in the evaluation of the most effective procedures for the selection of superior genotypes (Prasad and Shivani, 2017)<sup>[9]</sup>. Path coefficient analysis is a standardized partial regression coefficient that permits the measurement of the direct and indirect contribution of each independent character to the dependent character, which helps the breeder in determining the yield components and is thus useful in indirect selection. This investigation was designed to access

the relationship of yield attributes with seed yield through correlation coefficient and to investigate the direct and indirect effect of yield contributing characters on seed yield.

## 2. Materials and Methods

### 2.1 Plant material

A diverse collection of 238 genotypes of maize were included in this study. The seeds were procured from Main Maize Research Station (MMRS), Godhra, Anand Agricultural University (AAU), Anand. The material included 39 elite inbred lines of maize developed at MMRS, Godhra.

### 2.2 Description of the experimental site

The field experiment was carried out at the experimental farm of the MMRS, Godhra during *Rabi* 2020. The Main Maize Research Station is located in Agro-climatic zone-III (Middle Gujarat) of Gujarat state. Geographically, Godhra is situated at 22° 45' North latitude and 77° 40' East, with an altitude of 119 meters above mean sea level. The climate of the Godhra (middle Gujarat) region is semi-arid and tropical. The soil of the experimental site at Godhra is sandy loam, medium to poor productive and responsive to fertilizers, containing 80 per cent sand and 20 per cent clay. Water holding capacity is very poor. The depth of the soil is about 2.5 feet. Soil nitrogen availability is 0.043-0.046 per cent (low), medium in phosphorus and high in potash. During the experimental season (Nov 2020 to March 2021) temperature ranged from 8.5°C to 38.4°C and 0.00 mm rainfall (The meteorological data were recorded at the Meteorological Observatory, MMRS, AAU, Godhra).

### 2.3 Experimental design and management

The experiment was conducted using Randomized Complete Block Design (RCBD) with three replicates. Each genotype was accommodated in a single row spaced 6 m apart with a plant-to-plant spacing of 20 cm. The experiment was enclosed by a border row to avoid damage and border effect. The recommended agronomical and plant protection measures were followed for successful and healthy crop production.

### 2.4 Data collection

The Observations on fourteen quantitative traits *viz.*, days to 50% tasseling (FT), days to 50% silking (FS), days to maturity (DM), plant height (PH), ear height (EH), cobs per plant (CPP), kernel rows per cob (KRPC), kernels per row (KPR), cob length (CL), cob girth (CG), cob weight (CW), 1000 kernel weight (1000K) and kernel yield per plant (KYPP) were recorded in each row on five randomly selected competitive plants (tagged) from each replication and the mean value was computed for statistical analysis except days to 50 percent tasselling, days to 50 percent silking and days to maturity, which were recorded as per row basis. All the cob parameters and yield parameters were recorded at the physiological maturity of maize.

### 2.5 Data analysis

The replication-wise mean values of each genotype for various characters were used for statistical and genetic analysis. The analysis was carried out using R package variability v.0.1.0 (Popat *et al.*, 2020) [15] for the identification of character association of yield with yield attributes and path coefficient for the analysis of genetic correlation into direct and indirect effects. Genotypic and phenotypic coefficients of correlation were calculated from genotypic and phenotypic co-variances and variances as described by Singh and

Chaudhry (1985) [16] and Johnson *et al.* (1955) [10]. Direct and indirect effects were calculated by the path coefficient analysis as suggested by Dewey and Lu (1959) [5] at both phenotypic and genotypic levels. Kernel yield per plant was considered as the response variable while, days to 50% tasseling, days to 50% silking, days to maturity, plant height, ear height, cobs per plant, kernel rows per cob, kernels per row, cob length, cob girth, cob weight and 1000 kernel weight were included in the analysis as independent variables.

## 3. Results and Discussions

### 3.1 Correlations among morphological traits

Grain yield is a complex trait that is highly influenced by the environment and it is the result of the interrelationship of various yield attributes (Grafius, 1960) [8]. Genotypic correlation enables the estimation of the relative influence of one character on another as well as the prediction of correlated responses and construction of selection indices benefits from genotypic correlation in particular (Patel *et al.*, 2022) [14]. Thus, information on the extent of genetic association between yield and its attributes helps to ascertain the degree to which these traits are associated with economic productivity. Hence, knowledge regarding the association of character at both phenotypic and genotypic levels with kernel yield and among themselves provides a guideline to the plant breeder for making improvements through selection with a clear understanding of the contribution in respect of establishing the association by genetic and non-genetic factors (Dewey and Lu, 1959) [5]. Throughout the remainder of this paper, references will be made only to genotypic correlations to avoid unnecessary repetition.

*Correlation between Yield and Yield Component Traits:* In the present study in most cases that genotypic correlation coefficients were relatively higher than phenotypic correlation coefficients. This indicated that there was a strong inherent association between the characters studied and their phenotypic expression. The results of genotypic and phenotypic correlation coefficients for 14 yield and their contributing traits of maize are presented in (Table 1) and (Table 2) respectively. Highly significant ( $p < 0.001$ ) and positive genetic correlations were detected between kernel yield per plant and cob weight (0.578) followed by cob length (0.565), cobs per plant (0.555), and cob girth (0.482). The traits *viz.*, kernels per row, kernel row per cob, 1000 kernel weight, shelling percent, plant height and ear height also recorded positive and highly significant correlation with kernel yield per plant at both phenotypic and genotypic levels. On the contrary days to maturity (0.327) exhibited the highest significant negative correlation with kernel yield per plant followed by days to 50% silking (0.173) and days to 50% tasseling (0.164) at both genotypic and phenotypic levels. Hence, the improvement of these characters simultaneously increases kernel yield per plant.

The above results of significant positive correlation with kernel yield per plant are in harmony with the finding of Ahmed *et al.* (2020) [1] for cob girth and cob length, Nirupama and Marker (2020) [13] for cob length, cob girth and kernels per row, Chaurasia *et al.* (2020) [4] for shelling percent, cob length and girth, Zaman *et al.* (2020) [18] for cobs per plant, Krishna *et al.* (2021) [12] for cob girth, Patel *et al.* (2022) [14] for cob weight and shelling per cent. In contrast, days to 50% tasseling, days to 50% silking and days to maturity exhibited significant negative association with kernel yield per plant which is desirable in that direction. Therefore, it could be suggested that the selection of early maturing genotypes lines

ultimately increases kernel yield per plant without yield penalty. Similar results of negative correlation with kernel yield per plant were earlier reported by Ahmed *et al.* (2020)<sup>[1]</sup>, Chaurasia *et al.* (2020)<sup>[4]</sup> and Krishna *et al.* (2021)<sup>[12]</sup> for days to 50% tasseling, days to 50% silking and days to maturity.

**Inter-correlation among Yield Component Traits:** The appropriate knowledge of interrelationships of yield components can significantly improve the efficiency of the breeding program by determining the desirable traits to be used for yield improvement (Kanagasaru *et al.*, 2013)<sup>[11]</sup>. Highly significant ( $p < 0.001$ ) and positive association was found between Days to 50% silking and days to maturity (3.822) followed by days to 50% tasseling and days to maturity (3.768), days to 50% tasseling and days to 50% silking (0.999), plant height and ear height (0.765), cob weight and cob girth (0.743), cob girth and 1000 kernel weight (0.639), kernel per row and cob length (0.619). Days to maturity and shelling per cent (-0.836) exhibited a highly significant ( $p < 0.001$ ) negative relation followed by days to maturity and cob weight (0.734), days to maturity and cob girth (0.685), days to maturity and kernels per row (0.676) at the genetic level. The traits days to 50% tasseling, days to 50% silking and days to maturity established significant positive association among themselves and significant negative association with plant height, ear height, kernel rows per cob, kernels per row, cob length, cob girth, cob weight and shelling per cent while no relationship with cobs per plant and 1000 kernel weight at a genotypic level only. Cobs per plant had a significant positive correlation with plant height and ear height only and the remaining traits had no relationship. The significant positive inter-trait association was recorded among kernel rows per cob, kernels per row, cob length, cob girth and cob weight at a genotypic level only. Three traits *viz.*, cob length, cob girth and cob weight showed a significant positive relation with 1000 kernel weight. Shelling per cent had a significant positive association with cob weight and 1000 kernel weight.

In addition to the identification of yield attributing traits showing positive and significant association with kernel yield per plant, the information about the association of grain yield attributes with each other is also essential. The interrelationship between yield attributes revealed that the association of days to maturity with days to 50% tasseling and days to 50% silking is highly significant positive and more than one in magnitude further, the correlation between days to 50% tasseling and days to 50% silking is almost one. Indicating the interdependency of above three characters; generally genotypes with early in flowering showed early maturity comparatively. Therefore, these characteristics can also be considered during the selection process to bring about improvement for the highest yield with early maturity in yield. The findings of Nirupama and Marker (2020)<sup>[13]</sup>, Chaurasia *et al.* (2020)<sup>[4]</sup>, Krishna *et al.* (2021)<sup>[12]</sup>, Suresh *et al.* (2021)<sup>[17]</sup> and Patel *et al.* (2022)<sup>[14]</sup> are in close harmony with the above results of significant positive inter-trait association among days to 50% tasseling, days to 50% silking and days to maturity. Cobs per plant had a significant positive correlation with plant height and ear height only, this is because the taller plant would have more accommodation for more than one cob. An increase in cob girth will lead to an increase in kernel rows per cob and an increase in cob length would result in more kernels per row; this will trigger the cob weight. High 1000 kernel weight coupled with high cob weight ultimately increases shelling per cent and finally high

kernel yield. Nirupama and Marker (2020)<sup>[13]</sup> and Chaurasia *et al.* (2020)<sup>[4]</sup> observed a significant positive association between cob girth and 1000 kernel weight, kernels per row and cob length. Zaman *et al.* (2020),<sup>[18]</sup> Chaurasia *et al.* (2020)<sup>[4]</sup> and Suresh *et al.* (2021)<sup>[17]</sup> reported a significant positive relationship between plant height and ear height.

### 3.2 Path coefficient analysis among quantitative traits

The path-coefficient analysis provides an effective means of partitioning direct and indirect causes of correlation and permits a critical examination of the specific forces acting to exhibit an observed association and measures the relative importance of each causal factor. The (Table 3) consists of a matrix with direct effects (path coefficients) in the main diagonal and indirect effects in both off-diagonal portions. The diagram shown in (Figure 1) greatly explains the understanding of the nature of the cause and effect system. Kernel yield is the result of the direct effect of independent variables and their inter-correlation. The residual value in this study is 0.32, assumed to be independent of the remaining independent variables.

The highest positive direct effect was exerted by days to 50% tasseling (1.1055) followed by days to 50% silking (1.0827), cobs per plant (0.5324) and cob weight (0.4136) on kernel yield per plant. The highest positive indirect effect was exhibited by days to maturity (4.1658) via days to 50% tasseling followed by days to 50% silking (1.1048) via days to 50% tasseling, cob weight (0.5911) via days to 50% silking and kernels per row (0.5330) via days to 50% silking whereas Highest negative indirect effect was imparted by days to maturity (-4.1383) via days to 50% silking, days to 50% tasseling (1.0820) via days to 50% silking, cob weight (0.5992) via days to 50% tasseling and kernels per row (0.5382) via days to 50% tasseling.

Days to 50% tasseling (-0.1649) recorded a significant negative association with kernel yield per plant but, it had a positive direct effect (1.1055) on kernel yield per plant. Days to maturity (-0.3272) had a significant negative association with kernel yield per plant, but it has a positive effect (0.00056) on kernel yield per plant. Kernels per row have a significant and positive association with kernel yield per plant (0.3286), even though it has a negative direct effect (-0.062) on kernel yield per plant. The correlation between shelling per cent and kernel yield per plant is significant and positive (0.2732), even though it has a negative direct effect on kernel yield per plant (-0.0213).

Efforts made to determine the relative contributions of yield-related characters to kernel yield variation as yield is a complex trait and other traits contribute to yield positively or negatively. In this study residual effect at the genotypic level was 0.3291, indicating that the characters included in this study are contributing more than 67.09 per cent of variability pertaining to the dependent variable *i.e.* kernel yield per plant. Less than 32.91 per cent of contribution was from other yield contributing characters, which was not considered in this study.

Results of path analysis revealed that days to 50% tasseling is an important component of kernel yield, because it has a relatively large positive and direct effect, but had significant negative association with kernel yield per plant. The negative correlation between grain yield and days to 50% tasseling seems to be a consequence of negative indirect influence via days to 50% silking and cob weight. This point needs consideration because the direct effect of days to 50% tasseling is positive in direction. This negative association

indicated that this trait would be more rewarding for the selection of early maturing genotypes without yield penalty. Direct path values were more than one for days to 50% tasseling (1.1055) and days to 50% silking (1.0827), revealing that inflation due to multicollinearity among these independent variables was high. Nirupama and Marker (2020)<sup>[13]</sup> and Chaurasia *et al.* (2020)<sup>[4]</sup> reported a large direct effect of days to 50% tasseling and days to 50% silking on kernel yield per plant and considered an important factor affecting kernel yield. The magnitude of direct effect was more than one for days to 50% tasseling and days to 50% silking on kernel yield per plant were earlier reported by Ahmed *et al.* (2020)<sup>[1]</sup> and Suresh *et al.* (2021)<sup>[17]</sup>.

The magnitude of direct effect of cobs per plant is next to the days to 50% tasseling, hence may be regarded as another important character influencing kernel yield. This direct influence is reinforced by its direct contribution, thereby representing true correlation and could be taken as components for the improvement of yield. Further, cob weight had a high positive direct effect on kernel yield per plant next to cobs per plant highlighting its contribution towards yield. This direct influence is also reinforced by its direct and indirect contribution through days to 50% silking but negative indirect influence via days to 50% tasseling diluted the indirect influence via days to 50% silking. Although the correlation of cob girth and 1000 kernel weight with kernel yield per plant is positive and considerably large, the direct effect of these attributes on kernel yield is negligible and a positive correlation results from the indirect influence via cob

weight. Chaurasia *et al.* (2020)<sup>[4]</sup> reported a negligible positive direct effect of cob girth on kernel yield. The correlation of cob length with kernel yield is significant positive and its direct effect is also positive and considerable but the contribution from indirect influence via cob weight and days to 50% silking makes the total correlation positive. Chaurasia *et al.* (2020)<sup>[4]</sup> and Suresh *et al.* (2021)<sup>[17]</sup> found similar results of the considerable indirect contribution of cob length via days to 50% silking in total correlation. The trait days to maturity had significant negative association with kernel yield per plant, but it has negligible positive direct effect on kernel yield per plant. The negative indirect effects through days to 50% silking, cob length and cob weight contributed to significant negative correlation of days to maturity with kernel yield per plant. Chaurasia *et al.* (2020)<sup>[4]</sup> and (Krishna *et al.* (2021)<sup>[12]</sup> reported negligible positive direct effects on kernel yield per plant.

An examination of the correlation components reveals that days to 50% tasseling, days to 50% silking and cob weight were the three factors that exerted the greatest influence both directly and indirectly upon kernel yield. These three traits were important components in every correlation that involved kernel yield. The path coefficient analysis gave a somewhat different picture from what the Simple correlation analysis did. Consequently, it would appear that adopting a simple correlation study, a path coefficient analysis should give a true picture of the genetic relationship between various traits (Bhatt, 1973)<sup>[3]</sup>.

**Table 1:** Genotypic character association among yield and yield contributing traits in maize

	FT	FS	DM	PH	EH	CPP	KRPC	KPR	CG	CL	CW	1000K	SH	KYPP
FT	1.000	0.999 **	3.768 **	-0.279 **	-0.282 **	0.074	-0.156 *	-0.486 **	-0.023	-0.271 **	-0.542 **	-0.019	-0.1676**	-0.164 *
FS		1.000	3.822 **	-0.282 **	-0.287 **	0.064	-0.167 **	-0.492 **	-0.012	-0.278 **	-0.546 **	-0.013	-0.177 **	-0.173 **
DM			1.000	-0.277 **	-0.286 **	0.074	-0.092	-0.676 **	-0.685 **	-0.752 **	-0.734 **	-0.047	-0.836 **	-0.327 **
PH				1.000	0.765 **	0.231 **	0.326 **	0.453 **	0.326 **	0.426 **	0.267 **	0.051	0.158 *	0.255 **
EH					1.000	0.136 *	0.289 **	0.423 **	0.302 **	0.470 **	0.286 **	0.119	0.166 *	0.234 **
CPP						1.000	0.125	0.060	-0.005	0.087	0.011	0.005	0.048	0.555 **
KRPC							1.000	0.448 **	0.300 **	0.272 **	0.238 **	-0.076	0.0298	0.302 **
KPR								1.000	0.423 **	0.619 **	0.535 **	0.110	0.356 **	0.328 **
CG									1.000	0.592 **	0.743 **	0.639 **	0.290 **	0.482 **
CL										1.000	0.850 **	0.271 **	0.120	0.565 **
CW											1.000	0.352 **	0.565 **	0.578 **
1000K												1.000	0.256 **	0.280 **
SH													1.000	0.273 **
KYPP														1.000

**Table 2:** Phenotypic character association among yield and yield contributing traits in maize

	FT	FS	DM	PH	EH	CPP	KRPC	KPR	CG	CL	CW	1000K	SH	KYPP
FT	1.000	0.996 **	0.236 **	-0.072	-0.080 *	0.034	-0.007	-0.207 **	-0.176 **	-0.233 **	-0.276 **	-0.030	-0.227 **	-0.144 **
FS		1.000	0.233 **	-0.071	-0.081 *	0.031	-0.011	-0.208 **	-0.177 **	-0.236 **	-0.277 **	-0.031	-0.226 **	-0.148 **
DM			1.000	-0.089 *	-0.090 *	0.020	-0.071	-0.155 **	0.009	-0.075 *	-0.186 **	0.001	-0.021	-0.087 *
PH				1.000	0.798 **	0.203 **	0.210 **	0.351 **	0.119 **	0.209 **	0.225 **	0.019	0.057	0.213 **
EH					1.000	0.123 **	0.193 **	0.341 **	0.113 **	0.240 **	0.248 **	0.070	0.064	0.203 **
CPP						1.000	0.078 *	0.043	-0.007	0.025	0.004	0.005	0.016	0.516 **
KRPC							1.000	0.317 **	0.162 **	0.120 **	0.180 **	-0.012	0.012	0.219 **
KPR								1.000	0.271 **	0.399 **	0.494 **	0.129 **	0.241 **	0.315 **
CG									1.000	0.308 **	0.401 **	0.426 **	0.325 **	0.268 **
CL										1.000	0.566 **	0.243 **	0.155 **	0.360 **
CW											1.000	0.301 **	0.354 **	0.555 **
1000K												1.000	0.173 **	0.231 **
SH													1.000	0.202 **
KYPP														1.000

**Table 3:** Genotypic path coefficient analysis among yield and yield contributing traits in maize

	FT	FS	DM	PH	EH	CPP	KRPC	KPR	CG	CL	CW	1000K	SH	r <sub>g</sub> with KYPP
FT	1.1055	-1.0820	0.0021	0.0177	0.0036	0.0396	-0.0199	0.0302	-0.0017	-0.0379	-0.2241	-0.0016	0.0036	-0.164 *
FS	1.1048	-1.0827	0.0021	0.0179	0.0036	0.0346	-0.0212	0.0305	-0.0009	-0.0388	-0.2258	-0.0011	0.0038	-0.173 **
DM	4.1658	-4.1383	0.0006	0.0176	0.0036	0.0397	-0.0118	0.0420	-0.0518	-0.1051	-0.3036	-0.0038	0.0178	-0.327 **
PH	-0.3088	0.3056	-0.0002	-0.0635	-0.0097	0.1230	0.0415	-0.0281	0.0247	0.0595	0.1105	0.0041	-0.0034	0.255 **
EH	-0.3118	0.3117	-0.0002	-0.0486	-0.0126	0.0728	0.0367	-0.0263	0.0229	0.0658	0.1183	0.0094	-0.0035	0.234 **
CPP	0.0821	-0.0703	0.0000	-0.0147	-0.0017	0.5324	0.0160	-0.0038	-0.0004	0.0122	0.0046	0.0004	-0.0010	0.555 **
KRPC	-0.1729	0.1811	-0.0001	-0.0208	-0.0037	0.0669	0.1270	-0.0278	0.0228	0.0380	0.0986	-0.0061	-0.0006	0.302 **
KPR	-0.5382	0.5330	-0.0004	-0.0288	-0.0054	0.0324	0.0570	-0.0620	0.0320	0.0865	0.2213	0.0087	-0.0076	0.328 **
CG	-0.0254	0.0132	-0.0004	-0.0207	-0.0038	-0.0030	0.0382	-0.0262	0.0756	0.0827	0.3075	0.0507	-0.0062	0.482 **
CL	-0.2997	0.3012	-0.0004	-0.0271	-0.0059	0.0466	0.0346	-0.0384	0.0448	0.1396	0.3516	0.0215	-0.0026	0.565 **
CW	-0.5992	0.5911	-0.0004	-0.0170	-0.0036	0.0059	0.0303	-0.0332	0.0563	0.1187	0.4136	0.0280	-0.0120	0.578 **
1000K	-0.0217	0.0146	0.0000	-0.0033	-0.0015	0.0030	-0.0098	-0.0068	0.0484	0.0379	0.1459	0.0793	-0.0055	0.280 **
SH	-0.1853	0.1919	-0.0005	-0.0101	-0.0021	0.0260	0.0038	-0.0221	0.0220	0.0169	0.2337	0.0203	-0.0213	0.273 **
Residual = 0.3291														

\* and \*\* Significant at 0.05 and 0.01 levels of probability, (FT: Days to 50% tasseling, FS: Days to 50% silking, DM: Days to maturity, PH: Plant height, EH: Ear height, CPP: Cobs per plant, KRPC: Kernel rows per cob, KPR: Kernels per row, CL: Cob length, CG: Cob girth, CW: Cob weight, 1000K: 1000 kernel weight, SH: shelling per cent, KYPP: Kernel yield per plant

#### 4. Conclusion

Character association analysis revealed that kernel yield per plant found significant positive association with cob weight, cob length, cobs per plant, cob girth, kernel per row, kernel rows per cob, 1000 kernel weight, shelling per cent, plant height and ear height at both genotypic and phenotypic levels whereas, significant negative association was recorded with days to maturity, day to 50% tasseling and days to 50% silking at both genotypic and phenotypic levels. Path analysis revealed that days to 50% tasseling, cobs per plant, cob weight, cob length, kernel row per cob and cob girth were the major characters having positive direct effects and significant association with kernel yield per plant. Further, the characters viz., cobs per plant and cob weight had a true relationship with kernel yield per plant by establishing significant positive association and high positive direct effect on kernel yield. Emphasis should be given to flowering traits and maturity traits which are desirable in augmenting the selection of early genotypes without yield penalty. So, selection for these traits may be rewarding and they should be given importance while practicing selection aimed at improving kernel yield per plant in maize.

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