Int.J.Curr.Microbiol.App.Sci (2019) *8*(7): 2967-2977

EXCELLENT PUBLISHERS

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 8 Number 07 (2019)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2019.807.368

Studies on Interrelationship and Path Coefficient Analysis for Yield, Yield Attributing and Quality Traits Quality Protein Maize (*Zea mays* L.)

K. Sukumar*, V. Hemalatha, V. Narsimha Reddy and S. Narender Reddy

Jayashankar Telangana State Agricultural University, Telangana, India

**Corresponding author*

Keywords

Quality protein Maize, Yield, Quality parameters

Article Info

Accepted:
24 June 2019
Available Online:
10 July 2019

A B S T R A C T

Correlation studies indicated that ear length, ear girth, Number of kernel rows per ear, Number of kernels per row, 100 kernel weight, Shelling percentage, Crude protein content, tryptophan and lysine contents exhibited significantly positive correlations with grain yield. Path coefficient analysis indicated that Shelling percentage, ear girth, ear length, 100 kernel weight exhibited the highest positive direct effects both at genotypic and phenotypic levels and hence these traits play an important role in generating the high yielding genotypes through breeding programmes.

Introduction

Maize (*Zea mays* L.) is the third most important cereal crop of India after rice and wheat. It is a member of grass family, Poaceae and is highly cross pollinated crop. Greater significance is due to its demand for food, feed and industrial utilization. Due to its high genetic variability, numbers of high yielding genotypes have been derived from the base material.

However, malnutrition problems were observed where maize was consumed as staple food due to lack of essential amino acids especially among children, lactating mothers. High proportion of zein (seed storage protein of maize) fraction which is completely devoid of lysine and tryptophan is the primary cause of poor protein quality in maize because of which its biological value and net protein utilization was less.

However, efforts were made by the maize breeders to improve the nutritional quality in maize by incorporating modified opaque 2 into normal maize so that the digestability and biological values were improved with the enhanced levels of lysine and tryptophan contents. QPM has balanced leucine: isoleucine ratio with the increased niacin levels.

It is a better alternative to the animal protein that will be costly and plays a major role in meeting infant and lactating mother food requirements.

Materials and Methods

During *kharif*, 2015, a diallel set of 36 crosses along with 9 parents and two checks *viz*., DHM-117 and Vivek QPM 9 were sown in Randomized Block Design replicated thrice at RARS, Polasa, Jagtial of Telangana state. Each entry was sown in two rows of four meters length with a spacing of 75 cm between rows and 20 cm between the plants. The recommended fertilizers of N, P and K were applied in the ratio of 120: 80: 60 kg ha^{-1}. The entire P and K and half dose of nitrogen was applied as basal, while remaining half dose of N in two equal split doses at knee height and tasseling stages. Weeding operations, necessary plant protection measures were taken up to protect the crop from pests and diseases as per the recommendations along with the timely irrigation schedules to raise a healthy crop. Observations were taken on various characters .i.e. Days to 50 per cent anthesis, Days to 50 per cent silking, Anthesis silking interval (ASI), Days to maturity, Plant height (cm), Ear height (cm), Ear length (cm), Ear girth (cm), Number of kernel rows per ear, Number of kernels per row, 100 kernel weight (g), Shelling percentage, Crude protein content (%) and grain yield. Genotypic and phenotypic correlations were carried out while Path coefficient analysis was done based on the procedure given by Dewey and Lu (1959).

Results and Discussion

Generally, grain yield will be influenced by several yield attributing traits and there is a need to understand the nature and extent of character association in order to provide a solid base for the selection process in any breeding programme. Real associations are due to Genotypic correlations while phenotypic associations are due to genotype x environment interactions. Significant phenotypic correlations without significant genotypic associations are of no value. If the genotypic correlation is significant and phenotypic is not, it means that the existing real association is masked by environmental effect. This indicates the importance of genotypic correlation compared to phenotypic correlation.

Phenotypic and genotypic correlations were worked out on yield and yield contributing characters in 36 crosses and 9 parents at Jagtial location have been presented in Table.1. In general, phenotypic correlations provide the information on phenotypic expression of the traits and hence the phenotypic correlations have been discussed here under.

Days to 50 per cent anthesis was significantly and positively correlated with days to 50% silking and days to maturity while, it had negatively significant association with ear length, ear girth, shelling percentage, crude protein, tryptophan and lysine contents and thereby, significantly negative association was observed with grain yield.

Days to 50 per cent silking exhibited significantly positive association with days to maturity while, it had significantly negative association with ear length, ear girth, shelling percentage, crude protein, tryptophan and lysine content and grain yield.

Anthesis silking interval recorded negative but non-significant association with days to maturity and tryptophan contents whereas, the association was positive and non-significant with the remaining traits. Days to maturity exhibited significantly negative association with 100 kernel weight, shelling percentage, crude protein, tryptophan and lysine contents and grain yield. Plant height exhibited significantly positive association with days to anthesis, days to silking, ear height, ear girth and number of kernel rows per ear whereas, significantly negative association recorded with tryptophan and lysine. The trait exhibited positive but non-significant association with grain yield.

Ear height exhibited significantly positive association with ear length, ear girth, number of kernel rows per ear, number of kernels per row. None of the traits exhibited significantly negative association with ear height while, the association of ear height was found positive but non-significant with grain yield.

Ear length exhibited positive and significant associations with ear girth, number of kernel rows per ear, number of kernels per row, 100-kernel weight, shelling percentage, crude protein, tryptophan and grain yield while, a positive but non-significant association was observed for lysine content. The trait also exhibited significantly negative association with days to maturity.

Ear girth recorded significantly positive associations with the seven traits under study i.e. number of kernel rows per ear, number of kernels per row, 100 kernel weight, shelling percentage, crude protein, tryptophan content and grain yield while, days to maturity recorded significantly negative association with days to maturity.

Number of kernel rows per ear exhibited significantly positive association with number of kernels per row, 100- kernel weight, shelling percentage, crude protein content and grain while, it exhibited significantly negative association with days to maturity and lysine contents. Number of kernels per row exhibited positive and significant association with 100-kernel weight, shelling percentage and grain yield and the association was positive but non-significant for crude protein and tryptophan contents. Days to maturity and lysine contents were significantly and negatively associated with the character.

100-kernel weight recorded significant and positive associations were observed with shelling percentage, crude protein and grain yield while, it exhibited significantly negative association with lysine content. Negative but non-significant association was observed with tryptophan content.

The trait, shelling percentage associated significantly and positively with crude protein, tryptophan and grain yield while, positive and non-significant association was observed with lysine content.

Tryptophan and grain yield were associated significantly and positively with crude protein content but the association was negative and non-significant with lysine content.

Lysine and grain yield were associated significantly and positively with Tryptophan content.

Lysine content was significantly and positively associated with grain yield. These results are accordance with the findings of Mural *et al.*, (2012), Ramana Reddy *et al.*, (2013) Preeti Sharma *et al.*, (2017)

Path coefficient analysis

Path coefficient analysis allows separation of the direct effect and their indirect effects through other attributes by partitioning the correlations (Wright, 1921). Hence, the path coefficient analysis was undertaken to know the direct and indirect effects. Based on the data recorded on the genotypes in the present investigation, the phenotypic and genotypic correlations were estimated to determine direct and indirect effects of yield and yield contributing characters. The results are presented (Table 2 & Fig.1).

The direct effect (-0.0606) of days to 50 per cent anthesis was positive (0.1000).The negative and significant correlation (-0.2898) was mainly attributed to the indirect negative influence through plant height, anthesis silking interval, ear length, ear girth,number of kernels per row, days to maturity, 100 kernel weight, shelling percentage, crude protein and lysine. Indirect positive contribution also exhibited through days to 50 per cent silking, ear height, number of kernel rows per ear and tryptophan contents.

For Days to 50 per cent silking, direct effect was positive (0.0068) on grain yield with significantly negative correlation (-0.2748) which was due indirect negative influence through plant height, anthesis silking interval, ear length, ear girth, number of kernels per row days to maturity, 100- kernel weight, shelling percentage, crude protein and lysine whereas, days to 50 per cent anthesis, ear height, number of kernel rows per ear and tryptophan contributed towards the indirect positive effect.

For Anthesis silking interval, direct effect was positive (0.1025) with positive correlation (0.1625) mainly due to indirect positive effects through ear height, ear length, ear girth, number of kernels per row, days to maturity, 100 kernel weight, shelling percentage, crude protein, tryptophan and lysine whereas, it had indirect negative influence through plant height, days to 50 per cent anthesis, days to 50 per cent silking and number of kernel rows per ear.

For Days to maturity, direct effect was negative (-0.1763) with significantly negative correlation with grain yield (-0.4714) was mainly due to the indirect effects through plant height, anthesis silking interval, ear height, ear length, ear girth, number of kernels per row, 100 kernel weight, shelling percentage, crude protein and lysine whereas, positive indirect influence exhibited through days to 50 per cent anthesis, days to 50 per cent silking, number of kernel rows per ear and tryptophan content.

For Plant height, negative direct effect was observed (-0.1734) while, correlation was positive with grain yield (0.0001) was due to indirect positive influence through days to 50 per cent anthesis, days to 50 per cent silking, anthesis silking interval, ear height, ear length, ear girth, number of kernels per row, 100 kernel weight, shelling percentage and tryptophan. Indirect negative contribution observed through number of kernel rows per ear, days to maturity, crude protein and lysine contents.

For ear height, direct positive contribution (0.0183) and the correlation was positive with grain yield (0.1021) was due to indirect positive contribution through days to 50 per cent anthesis, days to 50 per cent silking, anthesis silking interval, ear length, ear girth, number of kernels per row, days to maturity, 100- kernel weight, shelling percentage and tryptophan while, it had indirect negative contribution through days to maturity, crude protein, tryptophan and lysine contents.

For ear length, positive direct effect (0.0453) was observed on grain yield with the significantly positive correlation (0.5968) was due to indirect positive contribution through anthesis silking interval, ear height, ear girth, number of kernels per row, days to maturity, 100-kernel weight, shelling percentage, crude protein and lysine whereas, it had indirect negative contribution on grain yield through plant height, days to 50 per cent anthesis, days to 50 per cent silking, number of kernel rows per ear and tryptophan content. Ear girth had direct positive influence (0.2897) on grain yield and the correlation was significantly positive (0.6508) at Jagtial was due to indirect positive influence on grain yield through anthesis silking interval, ear length, number of kernels per row, days to maturity, 100-kernel weight, shelling percentage and crude protein content whereas, it had indirect negative influence through plant height, days to 50 per cent anthesis, days to 50 per cent silking, number of kernel rows per ear, tryptophan and lysine.

For number of kernel rows per ear, direct negative effect (-0.1819) was exhibited on grain yield and the correlation was significantly positive (0.3804) was due to the indirect positive influence on grain yield through anthesis silking interval, ear height, ear length, ear girth, number of kernels per row, days to maturity,100-kernel weight, shelling percentage and crude protein while, it had indirect negative contribution on grain yield through plant height, days to 50 per cent anthesis, days to 50 per cent silking, tryptophan and lysine contents.

Number of kernels per row had direct positive influence (0.0317) on grain yield and the correlation was significantly positive (0.3638) was mainly due to the indirect positive influence through anthesis silking interval, ear height, ear length, ear girth, days to maturity, 100-kernel weight, shelling percentage and crude protein whereas, it had indirect negative influence through plant height, days to 50 per cent anthesis, days to 50 per cent silking, number of kernel rows per ear, tryptophan and lysine contents.

For 100 kernel weight, direct positive effect (0.0517) was observed on grain yield and the correlation was significantly positive (0.4893) was due to the indirect positive influence through anthesis silking interval, ear height, ear length, ear girth, number of kernels per row, days to maturity, shelling percentage, crude protein and tryptophan. Indirect negative influence observed through plant height, days to 50 per cent anthesis, days to 50 per cent silking, number of kernel rows per ear and lysine contents.

For Shelling percentage, direct positive effect (0.6778) was noticed on grain yield and the correlation was significantly positive (0.8045) while, it had indirect positive influence through ear height, ear length, ear girth, number of kernels per row, days to maturity, 100-kernel weight, crude protein and lysine con tents whereas, it had indirect negative influence through plant height, days to 50 per cent anthesis, days to 50 per cent silking and number of kernel rows per ear.

Crude protein content had direct positive effect (0.0128) on grain yield and the correlation was significantly positive (0.2902) was due to the indirect positive influence through plant height, anthesis silking interval, ear length, ear girth, number of kernels per row, days to maturity, 100-kernel weight and shelling percentage while, indirect negative influence observed through days to 50 per cent anthesis, days to 50 per cent silking, ear height, number of kernel rows per ear, tryptophan and lysine contents.

Tryptophan content, direct negative effect (-0.2483) was noticed on grain yield and the correlation was significantly positive (0.2241) was due to the indirect positive influence through days to 50 per cent anthesis, days to 50 per cent silking, anthesis silking interval, ear height, number of kernel rows per ear and 100-kernel weight.

Indirect positive influence observed through plant height, ear length, ear girth, number of kernels per row, days to maturity, shelling percentage, crude protein and lysine contents.

Table.1 Phenotypic (P) and Genotypic (G) correlations for sixteen characters at Jagtial

Character		PH	DA	DS	ASI	EH	EL	EG	KRE	KPR	DM	100KW	SP	CP	TRY	LYS	GY
PH	P	**1.0000**	0.2418**	0.2430**	0.0133	0.7287**	0.0963	0.1979*	0.2134*	0.1340	0.0627	0.1501	0.0667	-0.0630	-0.3736**	-0.3706**	**0.0001**
	G	**1.0000**	0.2526	0.2646	0.1360	0.7727	0.1026	0.2100	0.2494	0.1259	0.0564	0.1522	0.0617	-0.0777	-0.4149	-0.4225	**-0.0011**
DA	P		**1.0000**	0.9888**	-0.1497	0.0035	-0.2737**	-0.2633**	-0.1253	-0.0913	0.6057**	-0.1323	-0.3750**	-0.4180**	-0.4884**	-0.2452**	**-0.2898****
	G		**1.0000**	1.0013	-0.3911	-0.0010	-0.2785	-0.2659	-0.1271	-0.0943	0.6267	-0.1424	-0.3930	-0.4402	-0.5339	-0.2583	**-0.2963**
DS	P			**1.0000**	-0.0497	0.0140	-0.2686**	-0.2593**	-0.1089	-0.0795	0.5917**	-0.1271	-0.3739**	-0.4161**	-0.4995**	-0.2352**	**-0.2748****
	G			**1.0000**	-0.3272	0.0060	-0.2780	-0.2625	-0.1216	-0.0866	0.6230	-0.1324	-0.3959	-0.4454	-0.5438	-0.2575	**-0.2824**
ASI	P				**1.0000**	0.0840	0.0680	0.0602	0.1338	0.0989	-0.1300	0.0716	0.0404	0.0454	-0.0590	0.0987	**0.1625**
	G				**1.0000**	0.1607	0.1142	0.1728	0.1905	0.2164	-0.3755	0.2533	0.0844	0.0600	-0.0063	0.1230	**0.4037**
EH	P					**1.0000**	0.2247**	0.2608**	0.2398**	0.2089*	-0.0816	0.0291	0.1618	-0.0736	-0.1528	-0.1345	**0.1021**
	G					**1.0000**	0.2260	0.2681	0.2682	0.2132	-0.1027	0.0226	0.1575	-0.0836	-0.1659	-0.1519	**0.1011**
EL	P						**1.0000**	0.8359**	0.6443**	0.5827**	-0.4487**	0.4745**	0.6289**	0.3874**	0.4201**	0.1618	**0.5968****
	G						**1.0000**	0.8474	0.6928	0.5891	-0.4809	0.4868	0.6389	0.4006	0.4506	0.1657	**0.6004**
EG	P							**1.0000**	0.7639**	0.6799**	-0.4323**	0.6446**	0.6751**	0.3697**	0.3007**	-0.0672	**0.6508****
	G							**1.0000**	0.8223	0.6972	-0.4532	0.6673	0.6993	0.3857	0.3287	-0.0689*	**0.6609**
KRE	P								**1.0000**	0.8134**	-0.3034**	0.6222**	0.4079**	0.2704**	0.1287	-0.2053*	**0.3804****
	G								**1.0000**	0.8841	-0.3185	0.6995	0.4560	0.2758	0.1494	-0.2380	**0.4171**
KPR	P									**1.0000**	-0.2638**	0.5438**	0.3728**	0.1487	0.1377	-0.2574**	**0.3638****
	G									**1.0000**	-0.2831	0.5666	0.3742	0.1501	0.1494	-0.2890	**0.3715**
DM	P										**1.0000**	-0.3165**	-0.4123**	-0.3178**	-0.3607**	-0.3293**	**-0.4714****
	G										**1.0000**	-0.3617	-0.4578	-0.3601	-0.4268	-0.3694	**-0.5071**

Table contd…

Character		PH	DA	DS	ASI	EH	EL	EG	KRE	KPR	DM	100KW	SP	CP	TRY	LYS	GY
100KW	P											**1.0000**	0.4493**	0.2249**	-0.0314	-0.1786*	**0.4893****
	G											**1.0000**	0.4639	0.2415	-0.0329	-0.1995	**0.5001**
SP	P												**1.0000**	0.4306**	0.4185**	0.1581	**0.8045****
	G												**1.0000**	0.4455	0.4460	0.1524	**0.8213**
CP	P													**1.0000**	0.5228**	-0.0286	**0.2902****
	G													**1.0000**	0.5883	-0.0298	**0.2988**
TRY	P														**1.0000**	0.3856**	**0.2241****
	G														**1.0000**	0.4284	**0.2406**
LYS	P															**1.0000**	**0.1983****
	G															**1.0000**	**0.2087**

DA: Days to 50 per cent anthesis	**KRE: Number of kernel rows per ear**
DS: Days to 50 per cent silking	KPR: Number of kernels per row
ASI: Anthesis silking interval	100-KW: 100-Kernel weight (g)
DM: Days to maturity	SP: Shelling percentage
PH: Plant height (cm)	CP: Crude protein content (%)
EH: Ear height (cm)	TRY: Tryptophan content (%)
EG: Ear girth (cm)	LY: Lysine content (%)
EL: Ear length (cm)	GY: Grain yield (g/plant)

Table.2 Phenotypic (P) and Genotypic (G) Path coefficients for various characters in QPM maize at Jagtial

Character		PH	DA	DS	ASI	EH	EL	EG	KRE	KPR	DM	100KW	SP	CP	TRY	LYS	GY
PH	**P**	**-0.1734**	0.0242	0.0016	0.0014	0.0133	0.0044	0.0573	-0.0388	0.0043	-0.0111	0.0078	0.0452	-0.0008	0.0928	-0.0280	**0.0001**
	G	**-0.4731**	-0.2726	0.3698	0.0467	0.1141	0.0145	0.0542	-0.0250	-0.0177	-0.0122	-0.0115	0.0507	-0.0038	0.1289	0.0360	**-0.0011**
DA	**P**	-0.0419	**0.1000**	0.0067	-0.0153	0.0001	-0.0124	-0.0763	0.0228	-0.0029	-0.1068	-0.0068	-0.2542	-0.0054	0.1212	-0.0185	**-0.2898****
	G	-0.1195	**-1.0791**	1.3994	-0.1341	-0.0002	-0.0392	-0.0686	0.0127	0.0133	-0.1352	0.0108	-0.3229	-0.0216	0.1659	0.0220	**-0.2963**
DS	**P**	-0.0421	0.0989	**0.0068**	-0.0051	0.0003	-0.0122	-0.0751	0.0198	-0.0025	-0.1043	-0.0066	-0.2535	-0.0053	0.1240	-0.0178	**-0.2748****
	G	-0.1252	-1.0805	**1.3976**	-0.1122	0.0009	-0.0392	-0.0677	0.0122	0.0122	-0.1344	0.0100	-0.3253	-0.0218	0.1690	0.0220	**-0.2824**
ASI	**P**	-0.0023	-0.0150	-0.0003	**0.1025**	0.0015	0.0031	0.0174	-0.0243	0.0031	0.0229	0.0037	0.0274	0.0006	0.0147	0.0075	**0.1625**
	G	-0.0643	0.4220	-0.4573	**0.3430**	0.0237	0.0161	0.0446	-0.0191	-0.0305	0.0810	-0.0192	0.0693	0.0029	0.0020	-0.0105	**0.4037**
EH	**P**	-0.1264	0.0004	0.0001	0.0086	**0.0183**	0.0102	0.0756	-0.0436	0.0066	0.0144	0.0015	0.1097	-0.0009	0.0379	-0.0102	**0.1021**
	G	-0.3655	0.0011	0.0084	0.0551	**0.1477**	0.0318	0.0692	-0.0269	-0.0300	0.0222	-0.0017	0.1294	-0.0041	0.0515	0.0130	**0.1011**
EL	**P**	-0.0167	-0.0274	-0.0018	0.0070	0.0041	**0.0453**	0.2422	-0.1172	0.0185	0.0791	0.0245	0.4263	0.0050	-0.1043	0.0122	**0.5968****
	G	-0.0486	0.3006	-0.3886	0.0392	0.0334	**0.1409**	0.2186	-0.0694	-0.0829	0.1038	-0.0369	0.5249	0.0196	-0.1400	-0.0141	**0.6004**
EG	**P**	-0.0343	-0.0263	-0.0018	0.0062	0.0048	0.0379	**0.2897**	-0.1390	0.0216	0.0762	0.0333	0.4576	0.0047	-0.0746	-0.0051	**0.6508****
	G	-0.0993	0.2870	-0.3668	0.0593	0.0396	0.1194	**0.2580**	-0.0824	-0.0982	0.0978	-0.0506	0.5746	0.0189	-0.1021	0.0059	**0.6609**
KRE	**P**	-0.0370	-0.0125	-0.0007	0.0137	0.0044	0.0292	0.2213	**-0.1819**	0.0258	0.0535	0.0322	0.2765	0.0035	-0.0320	-0.0155	**0.3804****
	G	-0.1180	0.1372	-0.1699	0.0653	0.0396	0.0976	0.2121	**-0.1002**	-0.1245	0.0687	-0.0530	0.3747	0.0135	-0.0464	0.0203	**0.4171**
KPR	**P**	-0.0232	-0.0091	-0.0005	0.0101	0.0038	0.0264	0.1970	-0.1480	**0.0317**	0.0465	0.0281	0.2527	0.0019	-0.0342	-0.0195	**0.3638****
	G	-0.0596	0.1017	-0.1210	0.0742	0.0315	0.0830	0.1798	-0.0886	**-0.1408**	0.0611	-0.0429	0.3075	0.0074	-0.0464	0.0246	**0.3715**
DM	**P**	-0.0109	0.0606	0.0040	-0.0133	-0.0015	-0.0203	-0.1252	0.0552	-0.0084	**-0.1763**	-0.0164	-0.2795	-0.0041	0.0895	-0.0249	**-0.4714****
	G	-0.0267	-0.6762	0.8707	-0.1288	-0.0152	-0.0677	-0.1169	0.0319	0.0399	**-0.2157**	0.0274	-0.3762	-0.0176	0.1326	0.0315	**-0.5071**
100KW	**P**	-0.0260	-0.0132	-0.0009	0.0073	0.0005	0.0215	0.1868	-0.1132	0.0173	0.0558	**0.0517**	0.3045	0.0029	0.0078	-0.0135	**0.4893****
	G	-0.0720	0.1537	-0.1851	0.0869	0.0033	0.0686	0.1721	-0.0701	-0.0798	0.0780	**-0.0758**	0.3811	0.0118	0.0102	0.0170	**0.5001**
SP	**P**	-0.0116	-0.0375	-0.0025	0.0041	0.0030	0.0285	0.1956	-0.0742	0.0118	0.0727	0.0232	**0.6778**	0.0055	-0.1039	0.0119	**0.8045****
	G	-0.0292	0.4240	-0.5533	0.0289	0.0233	0.0900	0.1804	-0.0457	-0.0527	0.0988	-0.0352	**0.8217**	0.0218	-0.1386	-0.0130	**0.8213**
CP	**P**	0.0109	-0.0418	-0.0028	0.0047	-0.0013	0.0176	0.1071	-0.0492	0.0047	0.0560	0.0116	0.2919	**0.0128**	-0.1298	-0.0022	**0.2902****

Table contd…

Character		PH	DA	DS	ASI	EH	EL	EG	KRE	KPR	DM	100KW	SP	CP	TRY	LYS	GY
	G	0.0367	0.4751	-0.6225	0.0206	-0.0123	0.0564	0.0995	-0.0276	-0.0211	0.0777	-0.0183	0.3660	**0.0490**	-0.1828	0.0025	**0.2988**
TRY	P	0.0648	-0.0488	-0.0034	-0.0061	-0.0028	0.0190	0.0871	-0.0234	0.0044	0.0636	-0.0016	0.2837	0.0067	**-0.2483**	0.0291	**0.2241****
	G	0.1963	0.5762	-0.7600	-0.0022	-0.0245	0.0635	0.0848	-0.0150	-0.0210	0.0921	0.0025	0.3664	0.0288	**-0.3107**	-0.0365	**0.2406**
LYS	P	0.0643	-0.0245	-0.0016	0.0101	-0.0025	0.0073	-0.0195	0.0374	-0.0082	0.0581	-0.0092	0.1071	-0.0004	-0.0957	**0.0756**	**0.1983****
	G	0.1999	0.2787	-0.3599	0.0422	-0.0224	0.0233	-0.0178	0.0238	0.0407	0.0797	0.0151	0.1252	-0.0015	-0.1331	**-0.0853**	**0.2087**

DA: Days to 50 per cent anthesis	**KRE: Number of kernel rows per ear**
DS: Days to 50 per cent silking	KPR: Number of kernels per row
ASI: Anthesis silking interval	100-KW: 100-Kernel weight (g)
DM: Days to maturity	SP: Shelling percentage
PH: Plant height (cm)	CP: Crude protein content (%)
EH: Ear height (cm)	TRY: Tryptophan content (%)
EG: Ear girth (cm)	LY: Lysine content (%)
EL: Ear length (cm)	GY: Grain yield (g/plant)

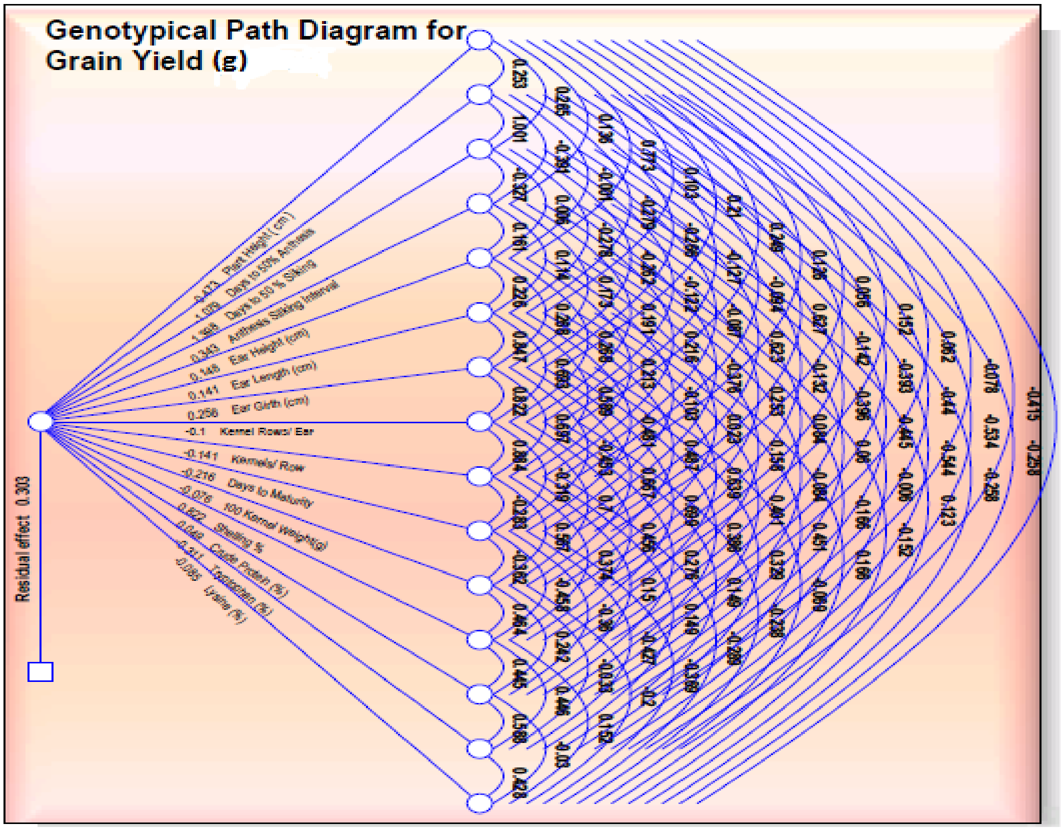

Figure.1 Genotypic path diagram for grain yield at Jagtial location

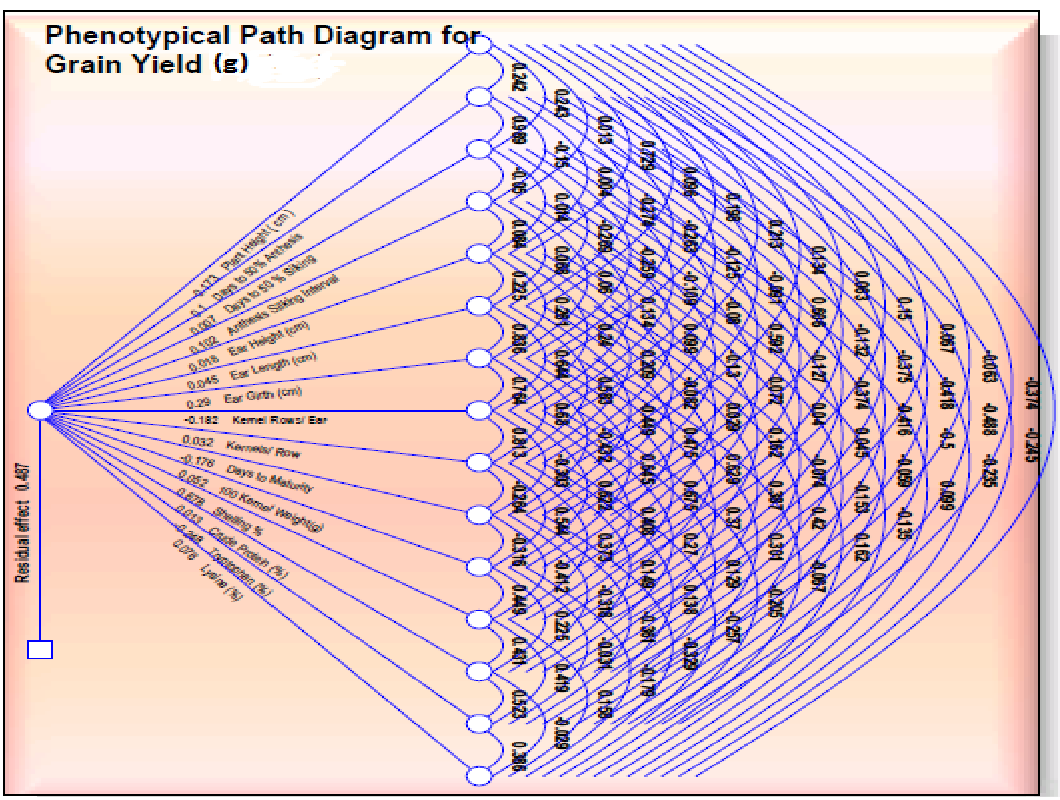

Figure.2 Phenotypic path diagram for grain yield at Jagtial location

Lysine content exhibited the direct positive effect (0.0756) on grain yield and the correlation was significantly positive (0.1983) was due to indirect positive influence through plant height, anthesis silking interval, ear length, number of kernel rows per ear, days to maturity and shelling percentage whereas, it had indirect negative influence through days to 50 per cent anthesis, days to 50 per cent silking, ear height, ear girth, number of kernels per row, 100 kernel weight, crude protein and tryptophan contents. These results are in concurrence with the findings of Ramana Reddy *et al.*, (2013), Tulu (2014) and Neha Rani and Niral (2015).

Path coefficient analysis provides an information that the traits with the highest positive direct effects at both the genotypic and phenotypic levels on grain yield and hence these traits play an important role in generating the high yielding genotypes in the future breeding programmes.

References

Dewey, D.R and Lu, K.H. 1959. A correlation and path coefficient analysis of components of crested wheat grass seed production. *Agronomy Journal*. 51: 515-518.

Mural, R.V., Chikkalingaiah and Hittalmani, S. 2012. Correlation study for protein content, grain yield and yield contributing traits in Quality protein Maize. *Electronic Journal of Plant Breeding*. 3(1): 649-651.

Neha Rani and Niral, A.2015. Correlation and path coefficient analysis of yield and its component traits in quality protein maize (*Zea mays* L.). *New Agriculturist*. 26(2): 231-236.

Preeti Sharma, Punia, M.S., Kamboj, M.C., Narender Singh and Mehar Chand. 2017. Evaluation of quality protein maize crosses through line x tester analysis for grain yield and quality traits. *Agricultural Science Digest*. 37 (1): 42-45.

Ramana Reddy,Y., Ravi, D., Ramakrishna Reddy, Prasad C.H., Zaidi, P.H., Vinayan, M.T and Blummel, M. 2013. A note on correlations between maize grain and maize stover quantitative and qualitative traits and the implications for whole maize plant optimization. *Field crops Research*.153: 63-69.

Tulu, B.N. 2014. Correlation and path coefficients analysis studies among yield and yield related traits of quality protein maize (QPM) inbred lines. *International Journal of Plant Breeding and Crop Science*. 1(2): 006-017.

Wright, S. 1921. Correlation and Causation. *Journal of Agricultural Research*. 20: 257-287.

How to cite this article:

Sukumar. K., V. Hemalatha, V. Narsimha Reddy and Narender Reddy. S. 2019. Studies on Interrelationship and Path Coefficient Analysis for Yield, Yield Attributing and Quality Traits Quality Protein Maize (*Zea mays* L.). *Int.J.Curr.Microbiol.App.Sci.* 8(07): 2967-2977.
doi: https://doi.org/10.20546/ijcmas.2019.807.368