Original Research Article

Assessment of genetic variability, cause and effect inter-relationship among yield component characters in Maize (*Zea mays* L.)

Comment [D1]:

Abstract

The present investigation was carried out to assess genetic variability parameters, correlation coefficient analysis, path analysis in 21 maize genotypes for 15 quantitative traits *viz* Days to 50% tasseling, Days to 50% silking, Days to 50% tasseling, Anthesis – silking interval, Days to 75% maturity, Plant height (cm), Ear height (cm), Cob length (cm), Cob girth (cm), Cob weight (g), Number of grain rows per cob, Number of grains per row, 100 grains weight (g), Biological yield per plant (g), Harvest index (%), Grain yield per plant (g) in Randomized Block Design with three replications in Kharif season of 2022 in experimentation field, Department of Genetics and Plant Breeding, Naini Agricultural Institute, Sam Higginbottom University Of Agriculture, Technology and Sciences, Prayagraj. Analysis of Variance revealed that high significant differences among the genotypes of all traits. Genotypes VL 19458, VL 19457, VL 183879, VL 19453 had depicted higher grain yield per plant. All the characters had expressed high to moderate estimates of heritability. GCV and PCV investigations revealed a high level of variation and the impact of environment in exhibiting of these traits. Grain yield per plant was positively and significantly associated at both genotypic and phenotypic levels, according to the correlation coefficient analysis between yield and yield attributing traits. In Phenotypic and Genotypic Path analysis a detailed analysis of diagonal values show positive direct effect on Grain yield per plant.

Comment [D2]: Mixture of lower and upper letters. Be consistent

Key Words : Genetic Variability, Path analysis, correlation coefficient analysis

1. Introduction

Maize (*Zea mays L.)* Chromosome number is 2n = 20, belongs to the family Poaceae, and also considered as a **miracle crop** is one of the important staple food crops of the world. Maize is also known as "**Queen of cereals**", because of its high productivity potential and wide range of adaptability to changing environments. Maize has diversified uses as food and industrial raw materials. Maize acreage and production have an increased tendency with the introduction of hybrids due to its high yield potential. It possesses one of the most well studied genetic systems among cereals which have motivated a rich history of research into the genetics of various traits in maize.

Maize has traditionally been a kharif or rainy season crop in northern India. However, there has been a noticeable shift in maize farming since the mid-1980s, with a bigger area under maize shifting to peninsular India. Peninsular India currently accounts for more than 40% of maize area and 50% of total maize production. At the same time, rabi or winter maize has made considerable advances in unconventional belts such as coastal Andhra Pradesh, Bihar, Telangana, West Bengal, and others. Spring maize is gaining popularity in the northwestern plains (Punjab, Haryana, and western Uttar Pradesh). **(IIMR, 2023).**

The degree of association between two variables is quantified by the Phenotypic Correlation, which is determined by hereditary factors and environmental factors. The correlation coefficient between the characters, on the other hand, does not always imply a cause-and-effect relationship. As a result, path analysis combined with correlation in grouping would provide a greater understanding of the cause-and-effect relationship between distinctive pairs of characters. **(Jayasudha and Sharma, 2010)**

1.1 Objectives

1. To assess the genetic variability of 21 genotypes for yield attributing characters in maize
2. To assess the correlation between yield and yield component characters in Maize
3. To estimate the direct and indirect effect of yield and its components in Maize

Comment [D3]: The introductory section is devoid of literature and short of facts to address the significance of the study

2. Materials and Methods

The experiment was conducted during the Kharif season of 2022 at field experimentation centre of Department of Genetics and Plant Breeding, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh. The experimentation site is situated 98m above sea level at 25.57^{0}N latitude and 81.56^{0}N longitude. This area's Subtropical Climate has extremely hot and cold seasons. Temperatures might drop as low as 1-2 degrees Celsius in December and January, especially during the rabi season. The temperature might reach 46 to 48 degrees Celsius during Zaid.

The 21 assessions of maize genotypes is carried out to perform the experiment conducted in Randomized Block Design with three replications with spacing Row to Row spacing is 45cm and Plant to Plant spacing is 20cm. In each replication five randomly selected best competitive plants are examined were recorded on following15 quantitative traits *viz* Days to 50% tasseling, Days to 50% silking, Days to 50% tasseling, Anthesis – silking interval, Days to 75% maturity, Plant height (cm), Ear height (cm), Cob length (cm), Cob girth (cm), Cob weight (g), Number of grain rows per cob, Number of grains per row, 100 grains weight (g), Biological yield per plant (g), Harvest index (%), Grain yield per plant (g).

Comment [D4]: Recast the entire statement

The Panse and Sukhatme (1967) method were used to analyse the variance in all of the recorded data for the characters under under consideration. Additionally, the genetic parameters genotypic coefficient of variation (GCV), Phenotypic coefficient of varation (PCV), Heritability in the broad sense, Genetic advance as percent of mean and correlation analysis was carried out by using the statistical methods. The additional components of variance include Phenotypic variance, Genotypic variance and Environmental Variance.

The Software called "R – Language" was used to perform the analysis mentioned above.

Experimental material

The experimental materials for this research were obtained from the SHUATS Department of Genetics and Plant Breeding in Prayagraj. The details of the experimental materials are mentioned below in table 1.

Table 1 : Experimental material

Comment [D5]: Do explain in details the methodology employed in carrying out the study.

S.no	Name of Genotype	S.no	Name of Genotype	S.no	Name of Genotype
1	VL 19458	8	VL 183963	15	VL 19271
2	VL 19457	9	VL 183889	16	VL 19374
3	VL 183879	10	VL 19270	17	VL 183958
4	VL 19453	11	VL 19403	18	VL 183954
5	VL 183957	12	VL 19461	19	VL 19465
6	VL 183959	13	VL 183927	20	VL 19476
7	VL 19478	14	VL 19456	21	MAKKA 3(Check)

3. Results and Discussion

3.1 Analysis of Variance

The analysis of variance for different characters are presented in table 2. The mean sum of squares due to genotypes showed significant difference for all the characters expect for number of cobs per plant. This indicates the presence of substantial genetic variability among the genotypes. In other words the performance of the genotypes with respect to these characters were statistically different, suggesting scope for improvement.

Comment [D6]: Change to except

Analysis of variance revealed that for all 15 quantitative traits shows genotype differences shows highly significant under study at 1% level of significance indicating the presence of genetic differences in the experimental material suggesting the importance of the genetic variability in order to identify the best genetic make-up provide better scope to selection.

Comment [D7]: Check and Recast

On the basis of mean performance, the highest grain yield per plant was observed for maize genotypes as VL 183957 (87.8), VL 19465 (70.267), VL 183927 (69.667), VL 19270 (69.2).

Comment [D8]: Indicate unit of yield measurement

3.1.1 Phenotypic and Genotypic variance

The variability estimates such as phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV), heritability in broad sense (h^2), genetic advance (GA), genetic advance of mean (GAM) for fifteen traits are explained under the following. For all the traits PCV was higher than GCV indicating that there is environment impact on genotypes. In the present study, Phenotypic coefficient of variation (PCV) was showing highest value for the character Days to 50% tasseling (33.447) followed by anthesis silking interval (30.631) followed by days to 50% silking (27.373), Harvest index (27.267), grain yield per plant (21.36) while the Genotypic Coefficient of Variation (GCV) was showing highest value for character for days to 50% tasseling (32.265), anthesis silking interval (29.333), days to 50% silking (26.47), harvest index (24.193).

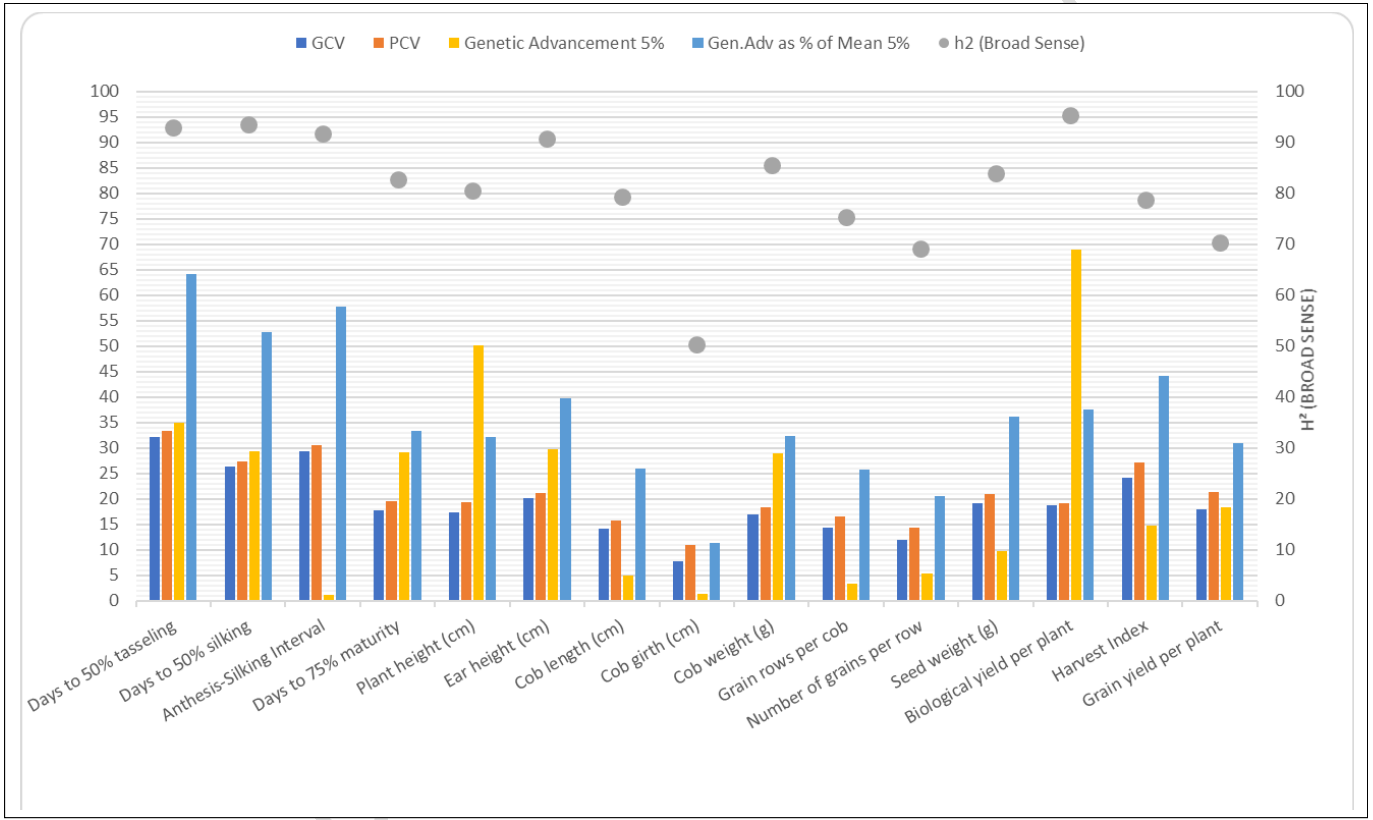
Table 2 : Analysis of variance (ANOVA) among 21 maize genotypes of 15 quantitative traits.

Sl.No.	Source	Mean Sum of Squares (MSS)		
		Replication	Treatment	Error
	Degrees of freedom	2	20	40
1	Days to 50% tasseling	2.3970	953.73**	23.147
2	Days to 50% silking	2.0480	668.705**	15.131
3	Anthesis-Silking Interval	0.0630	1.03**	0.03
4	Days to 75% maturity	3.8250	775.183**	50.475
5	Plant height (cm)	393.8640	2388.671**	176.99
6	Ear height (cm)	15.5340	712.547**	23.309
7	Cob length (cm)	2.8510	24.02**	1.911
8	Cob girth (cm)	0.0450	3.887**	0.961
9	Cob weight (g)	38.4850	733.913**	38.982
10	Grain rows per cob	0.7840	11.284**	1.11
11	Number of grains per row	1.2420	33.759**	4.355
12	100 Grain weight (g)	9.4180	84.567**	5.057
13	Biological yield per plant	86.8650	3583.611**	56.086
14	Harvest Index	17.1890	212.899**	17.598
15	Grain yield per plant	131.0770	388.465**	47.691

Table 3: Genotypic parameters of 15 quantitative traits in maize genotypes.

Sl.No.	**Characters**	**GCV**	**PCV**	**h^2 (Broad Sense)**	**Genetic Advancement (5%)**	**Gen.Adv as % of Mean (5%)**
1	Days to 50% tasseling	**32.265**	**33.447**	93.056	34.999	**64.116**
2	Days to 50% silking	26.47	27.373	93.506	29.402	52.727
3	Anthesis-Silking Interval	29.333	30.631	91.703	**1.139**	57.865
4	Days to 75% maturity	17.823	19.596	82.717	29.12	33.391
5	Plant height (cm)	17.362	19.334	80.64	50.228	32.118
6	Ear height (cm)	20.231	21.233	90.789	29.751	39.71
7	Cob length (cm)	14.119	15.844	79.413	4.984	25.919
8	Cob girth (cm)	**7.805**	**10.997**	**50.375**	1.444	**11.411**
9	Cob weight (g)	16.941	18.311	85.596	29.007	32.287
10	Grain rows per cob	14.416	16.608	75.338	3.293	25.775
11	Number of grains per row	12.051	14.483	69.238	5.366	20.658
12	100 Grain weight (g)	19.144	20.89	83.976	9.718	36.139
13	Biological yield per plant	18.689	19.13	**95.447**	**69.012**	37.613
14	Harvest Index	24.193	27.267	78.721	14.747	44.218
15	Grain yield per plant	17.926	21.36	70.43	18.425	30.99

Fig 1 : Bar diagram depicting GCV, PCV, heritability and genetic advance for 15 quantitative characters in Maize.



3.1 Heritability

- Heritability is showing moderate to high among the characters. These characters show no signs of low heritability. The high heritability and moderate heritability values for the traits under consideration in the current study indicated that they were less and moderate influenced by the environment and aided in the effective selection of features based on phenotypic expression utilising a simple selection approach.
- The present investigation, the highest heritability is showing with biological yield per plant (95.447) and lowest heritability is showing with cob girth (50.375) while the moderate range of heritability was showing with plant height (80.64), cob length (79.413) and harvest index (78.721).

3.2 Genetic Advance

- Genetic advance is showing values in between 69.012 to 1.139 among all the traits. The greater value is shoeing with Biological yield per plant (69.012) followed by Plant height (50.228), Days to 50% tasseling (34.99), Ear height (29.751) and the least value is showing with Anthesis – silking Interval (1.139).

3.3 Genetic Advance as percentage of Mean

- In the present investigation all the characters showed high genetic advance as percentage of mean with Days to 50% tasseling (64.116) followed by Anthesis silking interval (57.865), Days to 50% silking (52.727) while moderate values showing with 100 Grain weight (36.139), days to 75% maturity (33.391) and lowest values of Genetic advance as percentage of mean is showing with Number of grains per row (20.658) and Cob girth (11.411).
- All of the traits studied had a high heritability as well as a high advance as a percentage mean, indicating that the characters are predominantly regulated by additive gene action. As a result of the accumulation of more additive genes leading to further improvement, simple selection would be effective of these traits based on phenotypic expression.

Table 4: Correlation coefficient analysis

Traits		DT 50	DS 50	ASI	DM75	PH	EH	CL	CG	CW	GRPC	NGPR	100 GW	BYP	HI	GYP
DT 50	P	1.0000	0.949**	0.638**	0.901**	0.0701	-0.589**	0.660**	-0.2261	0.0112	0.1139	-0.420**	0.403*	-0.462**	0.609**	0.0748
	G	1.0000	0.825**	0.691**	0.888**	0.0992	-0.638**	0.758**	-0.257*	0.0067	0.1351	-0.516**	0.422**	-0.4840	0.625**	0.0221
DS 50	P		1.0000	0.665**	0.910**	0.0628	-0.603**	0.662**	-0.1899	0.0064	0.0920	-0.435**	0.395*	-0.447**	0.555**	0.0444
	G		1.0000	0.703**	0.785**	0.0868	-0.651**	0.758**	-0.287*	0.0279	0.1339	-0.512**	0.438**	-0.484**	0.650**	0.0449
ASI	P			1.0000	0.623**	-0.0653	-0.527**	0.507**	-0.1090	0.0249	-0.1492	-0.399*	0.0883	-0.2185	0.288*	-0.019
	G			1.0000	0.733**	-0.0812	-0.578**	0.583**	-0.1016	0.0719	-0.1907	-0.526**	0.0825	-0.2307	0.315*	-0.0428
DM 75	P				1.0000	-0.0278	-0.612**	0.613**	-0.1289	0.0528	0.1473	-0.387*	0.394*	-0.416**	0.536**	0.0588
	G				1.0000	0.0478	-0.700**	0.747**	-0.311*	0.0529	0.0827	-0.532**	0.495**	-0.480**	0.630**	0.0265
PH	P					1.0000	0.357*	0.0869	-0.1851	-0.387*	-0.1033	-0.0708	0.272*	-0.1625	0.0988	-0.088
	G					1.0000	0.419**	0.1086	-0.1696	-0.441**	-0.1468	-0.0890	0.331*	-0.1670	0.1387	-0.0774
EH	P						1.0000	-0.331*	-0.0538	-0.1472	0.0521	0.357*	-0.1048	0.2309	-0.289*	0.0048
	G						1.0000	-0.396*	-0.0847	-0.1793	0.0766	0.445**	-0.1479	0.249*	-0.331*	0.0031
CL	P							1.0000	0.1624	0.286*	0.1423	0.0297	0.305*	-0.2420	0.384*	0.0755
	G							1.0000	0.2186	0.354*	0.1538	-0.0360	0.357*	-0.289*	0.480**	0.0790
CG	P								1.0000	0.504**	0.2399	0.332*	-0.0211	0.307*	0.0040	0.324*
	G								1.0000	0.726**	0.326*	0.724**	-0.0183	0.477**	-0.0034	0.556**
CW	P									1.0000	0.276*	0.407**	0.326*	0.2171	0.252*	0.550**
	G									1.0000	0.374*	0.542**	0.311*	0.258*	0.364*	0.805**
GRPC	P										1.0000	0.318*	0.0516	-0.0308	0.268*	0.273*
	G										1.0000	0.426**	0.0856	-0.0373	0.334*	0.363*
NGPR	P											1.0000	-0.0878	0.1393	-0.015	0.2431
	G											1.0000	-0.1079	0.1767	0.0185	0.405**
100 GW	P												1.0000	-0.1992	0.460**	0.304*
	G												1.0000	-0.1977	0.561**	0.429**
BYP	P													1.0000	-0.575**	0.2407
	G													1.0000	-0.663**	0.2247
HI	P														1.0000	0.610**
	G														1.0000	0.537**
GYP	P															1.0000
	G															1.0000

DT 50 : Days to 50% tasseling**, DS 50 :**Days to 50% Silking**, ASI :** Anthesis silking interval, **DM75 :** Days to 75% maturity, **PH :** Plant Height, **EH :** Ear height, **CL :** Cob length, **CG :** Cob girth**, CW :** Cob weight, **GRPC :** Grain rows per cob, **NGPR :** Number of grains per row**, 100 GW :** 100 Grains weight**, BYP :** Biological yield per plant, **HI :** Harvest index**, GYP :** Grain yield per plant**.**

3.4 Phenotypic Correlation Coefficient

Grain yield shows a positive significant association with cob girth (0.324*), cob weight (0.550**), grain rows per cob (0.273*), 100 Grain Weight (0.304*), harvest index (0.610**), while positive non-significant association showed with days to 50% tasseling (0.0748), days to 50% silking (0.0444), days to 75% maturity (0.0588), ear height (0.0048), cob length (0.0755), number of grains per row (0.2431), biological yield per plant (0.2407). The negative non-significant association showed with anthesis silking interval (-0.0192), and plant height (-0.0882).

3.5 Genotypic Correlation Coefficient

Grain yield showed a highly significant positive association with cob weight (0.805**), cob girth (0.556**), number of grain rows per cob (0.363*), number of grains per row (0.405**), 100 Grain Weight (0.429**), harvest index (0.537**) while positive non significant association was showed with days to 50% tasseling (0.0221), days to 50% silking (0.0449), days to 75% maturity (0.0265), ear height (0.0031), cob length (0.0790), biological yield per plant (0.2247) and negative non significant association showed with anthesis silking interval (-0.0428), and plant height (-0.0774).

3.6 Phenotypic Path Coefficient Analysis

The phenotypic correlation is used to calculate phenotypic path coefficients. It categorises phenotypic coefficients as direct or indirect impacts on impact measurements. (Dewey and Lu, 1959). A detailed analysis from table 5 and Fig 2, The diagonal values show positive direct effects of Days to 50% silking (0.1346), Days to 75% maturity (0.0072), Ear height (0.0478), Cob weight (0.0813), Number of grains per row (0.0097), Biological yield per plant (0.8047) and Harvest index (1,2567). Negative direct effects were Days to 50% tasseling (-0.370), Anthesis silking interval (-0.0254), Plant height (-0.0530), cob length (-0.0337), Cob girth (-0.0275), Grain rows per cob (-0.0352) and 100 Grain weight (-0.0106) to Grain yield per plant.

3.7 Genotypic Path Coefficient Analysis

A review of the results on route coefficient for yield and yield components genotypic reveals that they are generally of similar direction and magnitude. Furthermore, the genotypic route coefficient was found to be larger in size than the phenotypic path coefficient, showing the masking influence of environment. A detailed analysis from table 5 and fig 3. The diagonal values show positive direct of Days to 50% silking (0.2012), Anthesis silking interval (0.0375), Cob length (0.0866), Number of grains per row (0.1576), 100 grain weight (0.0558), Biological yield per plant (1.1874) and Harvest index (1.6706). Negative direct effects were Days to 50% tasseling (-0.6836), Days to 75% maturity (-0.0116), Plant height (-0.1939), Ear height (-0.0242), Cob girth (-0.0901), Cob weight (-0.2451) and Grain rows per cob (-0.0682) to Grain yield per plant

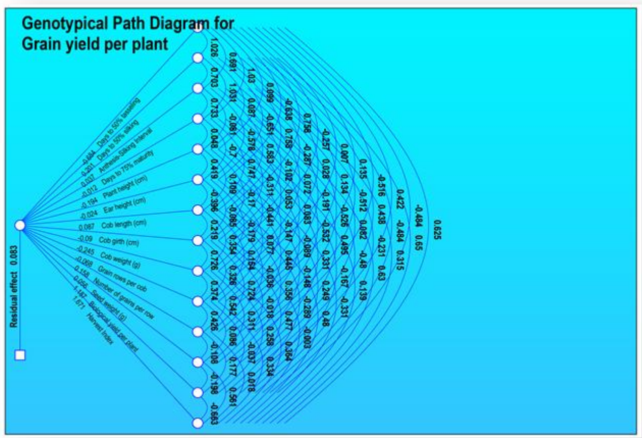
Table 5: Path Coefficient Analysis

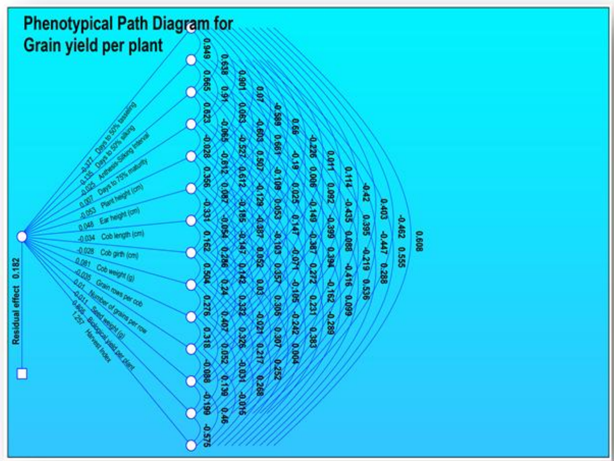
Traits		DT 50	DS 50	ASI	DM75	PH	EH	CL	CG	CW	GRPC	NGPR	100 GW	BYP	HI	GYP
DT 50	P	**-0.3770**	-0.3577	-0.2403	-0.3396	-0.0264	0.2222	-0.2489	0.0852	-0.0042	-0.0429	0.1582	-0.1521	0.1740	-0.2294	0.0748
	G	**-0.6836**	-0.7014	-0.4725	-0.7039	-0.0678	0.4364	-0.5178	0.1759	-0.0046	-0.0923	0.3526	-0.2886	0.3310	-0.4271	0.0221
DS 50	P	0.1277	**0.1346**	0.0895	0.1225	0.0084	-0.0811	0.0890	-0.0256	0.0009	0.0124	-0.0585	0.0531	-0.0601	0.0747	0.0444
	G	0.2065	**0.2012**	0.1414	0.2075	0.0175	-0.1309	0.1525	-0.0577	0.0056	0.0269	-0.1030	0.0881	-0.0973	0.1309	0.0449
ASI	P	-0.0162	-0.0169	**-0.0254**	-0.0158	0.0017	0.0134	-0.0129	0.0028	-0.0006	0.0038	0.0101	-0.0022	0.0055	-0.0073	-0.0192
	G	0.0259	0.0263	**0.0375**	0.0275	-0.0030	-0.0217	0.0218	-0.0038	0.0027	-0.0071	-0.0197	0.0031	-0.0086	0.0118	-0.0428
DM 75	P	0.0065	0.0065	0.0045	**0.0072**	-0.0002	-0.0044	0.0044	-0.0009	0.0004	0.0011	-0.0028	0.0028	-0.0030	0.0038	0.0588
	G	-0.0119	-0.0119	-0.0085	**-0.0116**	-0.0006	0.0081	-0.0086	0.0036	-0.0006	-0.0010	0.0062	-0.0057	0.0056	-0.0073	0.0265
PH	P	-0.0037	-0.0033	0.0035	0.0015	**-0.0530**	-0.0189	-0.0046	0.0098	0.0205	0.0055	0.0037	-0.0144	0.0086	-0.0052	-0.0882
	G	-0.0192	-0.0168	0.0157	-0.0093	**-0.1939**	-0.0812	-0.0211	0.0329	0.0854	0.0284	0.0173	-0.0642	0.0324	-0.0269	-0.0774
EH	P	-0.0282	-0.0289	-0.0252	-0.0293	0.0171	**0.0478**	-0.0159	-0.0026	-0.0070	0.0025	0.0171	-0.0050	0.0110	-0.0138	0.0048
	G	0.0154	0.0157	0.0140	0.0169	-0.0101	**-0.0242**	0.0096	0.0020	0.0043	-0.0019	-0.0108	0.0036	-0.0060	0.0080	0.0031
CL	P	-0.0223	-0.0223	-0.0171	-0.0206	-0.0029	0.0112	**-0.0337**	-0.0055	-0.0097	-0.0048	-0.0010	-0.0103	0.0082	-0.0129	0.0755
	G	0.0656	0.0657	0.0505	0.0647	0.0094	-0.0343	**0.0866**	0.0189	0.0307	0.0133	-0.0031	0.0309	-0.0250	0.0416	0.0790
CG	P	0.0062	0.0052	0.0030	0.0035	0.0051	0.0015	-0.0045	**-0.0275**	-0.0139	-0.0066	-0.0091	0.0006	-0.0085	-0.0001	0.324*
	G	0.0232	0.0258	0.0092	0.0280	0.0153	0.0076	-0.0197	**-0.0901**	-0.0654	-0.0294	-0.0652	0.0017	-0.0430	0.0003	0.556**
CW	P	0.0009	0.0005	0.0020	0.0043	-0.0315	-0.0120	0.0233	0.0409	**0.0813**	0.0224	0.0331	0.0265	0.0176	0.0205	0.550**
	G	-0.0016	-0.0068	-0.0176	-0.0130	0.1079	0.0439	-0.0868	-0.1779	**-0.2451**	-0.0917	-0.1327	-0.0761	-0.0632	-0.0893	0.805**
GRPC	P	-0.0040	-0.0032	0.0052	-0.0052	0.0036	-0.0018	-0.0050	-0.0084	-0.0097	**-0.0352**	-0.0112	-0.0018	0.0011	-0.0094	0.273*
	G	-0.0092	-0.0091	0.0130	-0.0056	0.0100	-0.0052	-0.0105	-0.0222	-0.0255	**-0.0682**	-0.0290	-0.0058	0.0025	-0.0228	0.363*
NGPR	P	-0.0041	-0.0042	-0.0039	-0.0038	-0.0007	0.0035	0.0003	0.0032	0.0039	0.0031	**0.0097**	-0.0009	0.0014	-0.0001	0.2431
	G	-0.0813	-0.0807	-0.0829	-0.0838	-0.0140	0.0702	-0.0057	0.1141	0.0854	0.0671	**0.1576**	-0.0170	0.0279	0.0029	0.405**
100 GW	P	-0.0043	-0.0042	-0.0009	-0.0042	-0.0029	0.0011	-0.0032	0.0002	-0.0035	-0.0005	0.0009	**-0.0106**	0.0021	-0.0049	0.304*
	G	0.0236	0.0244	0.0046	0.0276	0.0185	-0.0083	0.0199	-0.0010	0.0173	0.0048	-0.0060	**0.0558**	-0.0110	0.0313	0.429**
BYP	P	-0.3714	-0.3594	-0.1758	-0.3349	-0.1307	0.1858	-0.1948	0.2473	0.1747	-0.0248	0.1121	-0.1603	**0.8047**	-0.4623	0.2407
	G	-0.5750	-0.5742	-0.2739	-0.5702	-0.1983	0.2957	-0.3430	0.5668	0.3065	-0.0442	0.2098	-0.2347	**1.1874**	-0.7873	0.2247
HI	P	0.7646	0.6976	0.3618	0.6732	0.1242	-0.3634	0.4819	0.0050	0.3166	0.3369	-0.0192	0.5785	-0.7220	**1.2567**	0.610**
	G	1.0438	1.0866	0.5268	1.0517	0.2318	-0.5531	0.8016	-0.0056	0.6085	0.5582	0.0309	0.9377	-1.1077	**1.6706**	0.537**

DT 50 : Days to 50% tasseling**, DS 50 :**Days to 50% Silking**, ASI :** Anthesis silking interval, **DM75 :** Days to 75% maturity, **PH :** Plant Height, **EH :** Ear height, **CL :** Cob length, **CG :** Cob girth**, CW :** Cob weight, **GRPC :** Grain rows per cob, **NGPR :** Number of grains per row**, 100 GW :** 100 Grains weight**, BYP :** Biological yield per plant, **HI :** Harvest index**, GYP :** Grain yield per plant**.**

Fig. 2. Genotypic Path Coefficient

Fig. 3. Phenotypic Path Coefficient





4. Conclusion

From the present investigation it is concluded that among 21 genotypes on maize, VL 183957 was found superior followed by VL19465 for grain yield per plant. VL 183954 is the earliest to maturity was recorded by VL 19456. High PCV, GCV, heritability and genetic advance as percent of mean were recorded for days to 50% tasseling, Cob length. Grain yield per plant showed positive significant association with cob girth, cob weight, grain rows per cob, 100 Grain Weight, harvest index. Positive direct effect on grain yield per plant at both phenotypic and genotypic levels with days to 50% silking, number of grains per row, biological yield per plant, harvest index. These characters may be given due consideration during selection for crop improvement.

5. References

Comment [D9]: A number of the references listed is not sited in the text

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