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Genetic variation and association study for grain yield in germplasm accessions of maize (*Zea mays* L.)

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ABSTRACT

The present investigation aimed to find out the association among yield and its components and to sort out the traits that are directly or indirectly contributing towards yield in landraces of maize genotypes. The eighty eight (88) maize germplasm collections were used in present study during *Kharif* -2012 and *Kharif* -2013 in RCBD design. Pooled data and standard statistics were employed (means, ranges, GM±SE, standard error and coefficient of variation etc.) for analysis of the seventeen quantitative traits to have a reflection of the level of genetic variability. A considerable amount of variability was found among germplasms for various important traits ***viz.*** plant height, ear weight, ear length, 1000 kernel weight similarly grain yield per plant etc. grain yield exhibited positive and highly significant correlation with ear height, days to female flower initiation, days to 50% male flower initiation, days to 50% female flower initiation, days to maturity, 1000 grain weight, ear weight at genotypic and phenotypic level. Maximum phenotypic correlation coefficient was recorded by cob diameter (0.955) followed by days to female flower initiation (0.758), plant height (0.718*) and days to male flower initiation (0.679).Path analysis indicated that the character ear height (0.410) recorded highest of the direct effect followed by biological yield per plant (0.408), harvest index (0.328), days to female flower initiation (0.32), prop root (0.149) and 1000 kernel weight (0.136), so such traits may be rewarding and they should be given importance while practicing selection, aimed at improving grain yield per plant in maize. The genotypes JLM 22 was to be found best for high yield by considering all yield contributing traits followed by JLM 51, HKI 1344, CML 429, CML 470, JLM 30 JLM 2 and these can be utilized in further breeding programmes for producing single cross hybrids in Maize.

Key words: Genotypic variability and phenotypic variability, Germplasm, Grain yield, Maize.

INTRODUCTION

Maize (*Zea mays* L.; 2n=20) is one of the most important and a strategic food crop cultivated in the world. Maize grains have long been used for feed, food consumption and industrial products. (Romay *et al.*, 2013). Maize was first domesticated in Mexico, from its wild species ancestor, teosinte, about 9000 years ago, but maize landraces are widely found across the continents (Gaikwad *et al.,* 2016). Landraces (germplasm) evolved conventionally over the time, not only provides basic nutritional requirements as a food security but also in crop improvement programmes very much depend on the availability of a wide and reliable crop genetic diversity (Sharma *et al.*, 2015).

One of the major contributions will be the deployment of improved varieties, among local maize resources, that meet the prospect of producers. Certainly, the local resources have a considerable phenotypic and genetic diversity and constitute an essential component of food security, as they provide the raw material and can be used by breeders to improve the quality and productivity of maize (Gouesnard *et al,* 2005). An attempt was made to classify and understand the nature and magnitude of genetic diversity. The genotypic and phenotypic correlation coefficient had been used as an effective tool to determine the relative contribution of component characters towards yield in genetically diverse population for enhanced progress in crop breeding.

Moreover, the correlation between grain yield and a component character may sometimes be mislead due to an over estimation or underestimation for its association with other characters. Path coefficient was estimated to find out the association and quantify the direct and indirect influence of one character upon another. Information of nature and degree of divergence would help the plant breeder in choosing the right type of parent for future breeding programme to improve the quality characters in Maize breeding programmes.

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MATERIAL AND METHODS

The experimental material consisted of 88 genotypes including 62 landraces of *Desi* maize lines which was collected from different parts of Madhya Pradesh and 26 CIMMYT based QPM lines. The source of the germplasm accessions were presented in (Table 1). The experiment was laid out under ridges and furrows in a RCBD with three replications during *Kharif* 2012-2013 at Seed Breeding Farm, Department of Plant Breeding and Genetics, JNKVV, Jabalpur.

Planting of individual germplasm was done in 3 rows of 4 m length adopting a spacing of 60 cm between rows and 20 cm between the plants. Standard cultural practices were applied for field maintenance and harvesting according to package of recommendation. Observations were recorded on five robust plants in each genotype per replication and mean values plant basis were obtained. Biometrical data of 17 yield contributing traits were collected on plant height (cm), ear height from ground (cm), days to male flower initiation, days to female flower initiation, days to 50% male flowering, days to 50% female flowering, days to maturity, ear length (cm), number of rows/ear , 1000-grain weight (g) , ear weight (g), stem girth (cm), cob diameter (cm) , biological yield per/plant (g), harvest index (%), number of prop roots, and grain yield per plant were recorded.

Simple statistics was considered to have a thought of the level of genetic diversity. Means of the data collected across seasons were subjected to assessment of correlation as well as path coefficient analysis was performed using the software 'Statistical Package for Agricultural Research (SPAR1.0) and means were compared using least significant difference at P $\leq$0.05 and 0.01.

RESULTS AND DISCUSSION

Germplasm is a source of variation and selection achieve through genetic variation and promote rational use of genetic resources of maize. The expression of genetic variability for each of the traits were employed by standard statistics including the extreme genotype mean values and means with their standard errors obtained on the basis of average data are summarized in Table (2). The genotypic and phenotypic correlation coefficient had been estimated for determining the comparative contribution of component traits on yield (Table 3). Path coefficient analysis will be an important tool to find out the association and quantify the direct and indirect influence of one character upon another (Dewey and Lu, 1959). Each component has two parts of action *viz.* (1) the direct effect and (2) indirect effects (Table 4)

The various yield and its important traits employed in present study with keeping the foregoing points (a) Assessment of genetic variability and (b) estimation of correlation and path coefficient in maize germplasm. Information on the nature and degree of divergence would help the plant breeder in choosing the right type of parent for future breeding programme to improve the various desirable traits.

Wide range of variability for most of the characters showed among maize genotypes and all the traits exhibited broad spectrum of ranges between the maximum and minimum genotype mean values. For instance plant height ranged from 149.43 to 232.83 with a mean of 174.14, ear height ranged from 60.67 to 151.67 with a grand mean of 89.43. However, days to male flower initiation has to be found and varied from 77.33 to 94 with grand mean of 66.45 similarly days to female flower initiation were also to be ranged from 80.55 to 96.89 with a grand mean of 70.37. The trait days to 50% male flower initiation ranged from 78.33 to 95.00 with the mean of 67.66 similarly, days to 50% female flower initiation ranged from 81.33 to 97.33 with the mean of 71.51.Days to maturity ranged from 107.8 to 126.11 with a mean of 101.02, ear length ranged from 9.00 to 20.53 with a mean of 14.67 at the same time number of rows per ear has to be ranged from 10.67 to 20 with a grand mean of 13.55. 1000 grain yield is one of the most important trait which shrewd enormous variation among the maize genotypes. For this trait minimum (13.83 gm) and maximum (35.67 gm) 1000 grain weight were recorded which showed significant variation. Trait ear weight has to be ranged from 69 to 304 gm with a grand mean of 110.29 gm. However, stem girth and cob diameter was also varied from 4.33 and 3.94 to 10.56 and 3.99 with a grand mean of 6.321 and 3.89 respectively. Consequently, the minimum (127.73) and maximum (675.33) value were recorded for the trait biological yield and grand mean has to be found 241.5. Harvest index ranged from 18.58 to 48.40 with the mean of 37.85 whereas prop root also showed minimum variation which ranged from 0 to 2. Grain yield is one of the most important and desirable trait in crop improvement programme. The minimum (228.33) and maximum (41.43) grain yield were recorded with a grand mean of 456.06. Thus, the sufficient amount of variability has been present in present investigating material. Therefore, these germplasm has to be succeeding for grain improvement or by direct selection. Similar work has been studied by Halidu *et al.,* 2015 and Mahesh *et al.,* 2013. Mean of all the characters, showed wide range of variability among maize genotypes (Table 2).

Correlation between grain yield and its components revealed that among the 17 characters studied only 4 characters *viz*. plant height, days to female flower initiation, days to male flower initiation and cob diameter recorded significant positive phenotypic correlation with grain yield per plant (Table 4). Maximum phenotypic correlation coefficient was recorded by cob diameter (0.955) followed by days to female flower initiation (0.758), plant height (0.718) and days to male flower initiation (0.679) and the

Table 1: Name and source of the germplasm accessions of maize.

S.N.	Genotypes	Source	S.N.	Genotypes	Source
1	JLM 1	Bairiha	45	JLM 45	Karwahi, Majhauli
2	JLM 2	Hadbada	46	JLM 46	Karmati, Sidhi
3	JLM 3	Hadbada	47	JLM 47	Babawa, , Majhauli
4	JLM 4	Bairiha	48	JLM 48	Chamaradal, Majhauli
5	JLM 5	Bairiha	49	JLM 49	Raihal, Kushmi, Sidhi
6	JLM 6	Bairiha	50	JLM 50	Khamha, Sidhi
7	JLM 7	Hadbada	51	JLM 51	Kuchawahi, Sidhi
8	JLM 8	Bairiha	52	JLM 52	Gajari, Majhauli
9	JLM 9	Bariha	53	JLM 53	Tikari, Majhauli
10	JLM 10	Hadbada	54	JLM 54	Tikari, Majhauli
11	JLM 11	Hadbada	55	JLM 55	Tikari Majhauli
12	JLM 12	Patehara Khurd	56	JLM 56	Tikari, Majhauli
13	JLM 13	Patehara Khurd	57	JLM 57	Tikari, Majhauli
14	JLM 14	Patehara Khurd	58	JLM 58	Tikari, Majhauli
15	JLM 15	Hadbada	59	JLM 59	Tikari, Majhauli
16	JLM 16	Bariha	60	JLM 60	Tikari, Majhauli
17	JLM 17	Tala	61	JLM 61	Tikari, Majhauli
18	JLM 18	Mahuva Gaon	62	JLM 62	Tikari, Majhauli
19	JLM 19	Sidhi	63	Bulk line 22	CIMMYT
20	JLM 20	Kushmimahar	64	BML-7	CIMMYT
21	JLM 21	Dal,Majhauli	65	CML 474	CIMMYT
22	JLM 22	Masamli (Sidhi)	66	CML 478	CIMMYT
23	JLM 23	Majhauli (Sidhi)	67	VL 1030	CIMMYT
24	JLM 24	Kushmahar, Rampur (Sidhi)	68	VL 1047	CIMMYT
25	JLM 25	Tamsar Kusmi Sidhi	69	VL 1046	CIMMYT
26	JLM 26	Chhawari, Sidhi	70	VL 1033	CIMMYT
27	JLM 27	Tikari Majhauli (Sidhi)	71	VL 1087	CIMMYT
28	JLM 28	Hathrikhad, Sidhi	72	VL 109183	CIMMYT
29	JLM 29	Kochila-Sidhi	73	VL 1016196	CIMMYT
30	JLM 30	Sidhi	74	VL 1018798	CIMMYT
31	JLM 31	Bari Sidhi	75	VL 1029	CIMMYT
32	JLM 32	Sidhi	76	VL 108729	CIMMYT
33	JLM 33	Majhauli	77	L.NO. 21	CIMMYT
34	JLM 34	Baiga	78	L.NO.27	CIMMYT
35	JLM 35	Boraba Kusumi	79	HKI 13441	CIMMYT
36	JLM 36	Majhauli	80	BML-6	CIMMYT
37	JLM 37	Kushmahar, Rampur Naikin	81	HKI -161	CIMMYT
38	JLM 38	Karmai, Majhauli	82	HKI-163	CIMMYT
39	JLM 39	Sanghar, Kusumi	83	CML 286	CIMMYT
40	JLM 40	Akamna, Majhauli	84	CML 470	CIMMYT
41	JLM 41	Tikari Majhauli	85	VL 101123	CIMMYT
42	JLM 42	Karmuya, Singrauli	86	CML 429	CIMMYT
43	JLM 43	Barwani , Sidhi	87	CML 472	CIMMYT
44	JLM 44	Hathikhad, Sidhi	88	VL 1031	CIMMYT

Note: Genotype 1-62 are *Desi* Maize collected from tribal areas of Madhya Pradesh (India) and genotype 63-88 QPM based lines received from CIMMYT (Mexico).

same findings were reported by Balbinot *et al.,* 2005 and Wali *et al.,* 2006). For inter-correlation among yield components only two of the traits *i.e.* ear height (0.813) and grain yield per plant showed significant positive relationship with plant height, which confirms with the findings of Eleweanya *et al.*, 2005 and Ei-shouny *et. al.*, 2005.

With respect to days to male flower initiation maximum of the characters like days to female flower initiation (0.945) followed by days to 50% male flower initiation (0.914), days to 50% female flower initiation (0.869), days to maturity (0.713), 1000 kernel weight (0.701), ear weight (0.815) and grain yield per plant (0.679) recorded highly significant positive correlation

Table 2: Means, ranges, CV and standard errors of for 17 quantitative traits of 88 maize germplasms

Traits	Mean	Range		GM± SE	Standarderror	CV
		Min	Max			
PH	174.14	149.43	232.83	174.14±1.90	10.78	1.88
EH	89.43	60.67	151.67	89.43±1.36	5.58	2.64
DFI(M)	66.45	77.33	94	66.45±0.60	1.09	1.57
DFI(F)	70.37	80.55	96.89	70.37±0.64	1.23	1.57
D50%M	67.76	78.33	95	67.76±0.72	1.55	1.83
D50%F	71.51	81.33	97.33	71.51±0.74	1.66	1.8
DM	101.02	107.8	126.11	101.02±0.68	1.4	1.17
EL	14.67	9	20.53	14.67±0.40	0.49	4.74
Row/ear	13.55	10.67	20	13.55±0.49	0.73	6.3
1000GW	23.61	13.83	35.67	23.61±0.74	1.63	5.4
EW	110.29	69	304.9	110.29±1.74	9.06	2.72
SG	6.321	4.33	10.56	6.321±0.11	0.04	2.98
CD	3.89	3.94	3.99	3.89±0.09	0.02	3.82
BY	241.5	127.73	675.33	241.50±5.62	8.95	7.12
HI	37.85	18.58	48.4	37.85±1.58	94.64	14.53
PR	1.66	0	2	1.66±0.14	7.45	3.43
GYPP	456.06	41.43	228.33	87.02±1.73	0.06	4.02

Note: PH= Plant Height, EH=Ear Height from ground, DFI(M)=Days to male flower initiation, DFI(F)=Days to female flower initiation,D50%M=Days to 50% male flower initiation,D50%F=Days to 50%female flower initiation, DM=Days to maturities, EL=Ear Length, Rows/ear=No. of rows per ear, 1000GW= 1000 kernel weight, EW=Ear weight, SG=Stem Girth, CD=Cob Diameter, BY=Biological yield, HI= Harvest Index, PR= Prop roots, GYPP= Grain yield per plant.

coefficient. Hence these traits showing positive correlation coefficient and can be improved by direct selection. Whereas ear length (-0.528), stem girth (-0.22), cob diameter (-0.037) and harvest index (-0.185) were found to be negatively correlated with prop roots so indirect selection for such traits will be rewarding.

Path coefficient provides more information among variables than do correlation coefficients since this analysis provides the direct effects of specific yield components on yield, and indirect effects via other yield components (Garcia Del Moral et al., 2003). Path coefficient analysis allows separation of the direct effect and their indirect effects through other attributes by partitioning the correlations (Wright, 1921). Hence genotypic correlation is further partitioned into direct and indirect effect in order to deduce exact relation between yield and its component. In general genotypic direct and indirect effects were higher in magnitudes as compare to phenotypic direct and indirect effects. And both the effects followed the same pattern. As for the direct effects the genotypic path coefficient analysis of different yield contributing and associated traits on grain yield per plant revealed that the character ear height (0.410) recorded highest of the direct effect followed by biological yield per plant (0.408), harvest index (0.328), days to female flower initiation (0.32), prop root (0.149),and 1000 kernel weight(0.136), so such traits may be rewarding and they should be given importance while practicing selection , aimed at improving grain yield per plant in maize which was also reported by Sandeep Kumar *et al*., (2011). Whereas character like days to male flower initiation (-0.040), days to 50% male flower initiation (-0.147), rows per ear showed negative direct effect (Table 4).

In indirect effects the character plant height exhibited highly significant positive indirect effect on grain yield per plant (0.718). Moderate positive indirect effect was manifested via ear weight (0.361) on grain yield. However it's other indirect effect either of the sign manifested via other characters on grain yield were of negligible magnitude.Likewise days to male flower initiation exhibited highest positive indirect effect on grain yield per plant (0.679), in which moderate effects were revealed via ear weight (0.335) and biological yield per plant. These findings were also reported by Bello *et al*., (2010) and indicated that ear weight and biological yield alone may be given prime importance in selection programme for higher grain yield improvement in maize. The residual effect (0.046) indicates

Table 3: Estimates of genotypic (rg) and phenotypic (rg) correlation coefficient for 17 characters under studied.

Traits		PH	EH	DFI(M)	DFI(F)	D50% M	D50% F	DM	EL	Row/Ear	1000GW	EW	SG	CD	GYPP	BY	HI	PR
PH	G	1	0.828**	0.358	0.43	0.361	0.386	0.405	0.501	0.766*	0.395	0.923	0.119	0.463	0.757*	0.314	-0.221	0.473
	P	1	0.813**	0.313	0.367	0.313	0.324	0.356	0.318	0.385	0.336	0.878	0.114	0.429	0.718*	0.208	-0.173	0.183
EH	G		1	0.452	0.49	0.395	0.435	0.483	0.688	0.519	0.702*	0.308	0.12	0.425	0.121	0.515	0.152	0.315
	P		1	0.401	0.429	0.344	0.373	0.438	0.443	0.278	0.607*	0.265	0.121	0.4	0.082	0.406	0.123	0.116
DFI(M)	G			1	0.004	0.003	0.985**	0.855**	0.075	0.507	0.922**	0.943**	0.14	0.242	0.781*	0.956**	0.283	0.629*
	P			1	0.945**	0.914**	0.869**	0.713*	0.049	0.272	0.701*	0.815**	0.122	0.175	0.679*	0.786*	0.225	0.229
DFI(F)	G				1	0.01	0.979**	0.926**	0.014	0.741	0.034	0.039	0.166	0.262	0.897**	0.087	0.362	0.66*
	P				1	0.874**	0.887**	0.764*	-0.007	0.4	0.764*	0.882**	0.146	0.203	0.758*	0.871**	0.258	0.225
D50%M	G					1	0.015	0.824**	0.006	0.172	0.931	0.738*	0.128	0.161	0.598	0.681*	0.312	0.559
	P					1	0.892**	0.683*	-0.011	0.136	0.688*	0.626*	0.109	0.115	0.508	0.546	0.223	0.221
D50%F	G						1	0.881**	0.006	0.334	0.097	0.786*	0.173	0.243	0.673*	0.847**	0.244	0.518
	P						1	0.717*	-0.007	0.192	0.781*	0.642*	0.146	0.167	0.541	0.66*	0.143	0.197
DM	G							1	0.465	-0.119	0.974**	0.303	0.054	-0.036	0.36	0.554	-0.013	0.711*
	P							1	0.301	-0.036	0.78	0.278	0.051	-0.01	0.322	0.489	-0.016	0.619*
EL	G								1	0.918**	0.88**	0.358	0.583	0.287	0.87	0.343	0.064	-0.528
	P								1	0.319	0.094**	0.901**	0.388	0.816**	0.57	0.828**	0.052	-0.41
Row/Ear	G									1	0.501	0.776	0.402	0.638*	0.741	0.035	0.061	0.109
	P									1	0.235	0.398	0.214	0.304	0.385	0.00	0.481	0.443
1000GW	G										1	0.601	0.42	0.796**	0.182	0.627*	0.107	0.189
	P										1	0.357	0.359	0.648*	0.004	0.293	0.092	0.029
EW	G											1	0.516	0.294	0.022	0.721*	0.982**	0.739*
	P											1	0.501	0.186	0.006	0.658*	0.824**	0.291
SG	G												1	0.193	0.412	0.227	-0.523*	-0.517
	P												1	0.176	0.4	0.132	-0.413	-0.22
CD	G													1	0.047	0.993**	0.553*	-0.025
	P													1	0.955**	0.885**	0.401	-0.037
BY	G														1	0.812**	0.188	0.651
	P														1	0.747*	0.062	0.667
HI	G															1	1	-0.685
	P															1	1	-0.185
PR	G																	1
	P																	1

***, ** Significance at 5% and 1% probability level, respectively**

Note: PH= Plant Height, EH=Ear Height from ground, DFI(M)=Days to male flower initiation, DFI(F)=Days to female flower initiation,D50%M=Days to 50% male flower initiation,D50%F=Days to 50%female flower initiation, DM=Days to maturities, EL=Ear Length, Rows/ear=No. of rows per ear, 1000GW= 1000 kernel weight, EW=Ear weight, SG=Stem Girth, CD=Cob Diameter, GYPP= Grain yield per plant, BY=Biological yield, HI= Harvest Index, PR= Prop roots.

Table 4: Direct and indirect effect of various traits on yield per plant at phenotypic level.

Traits	PH	EH	DFI(M)	DFI(F)	D50%M	D50%F	DM	EL	Row/Ear	1000GW	EW	SG	CD	BY	HI	PR	GYPP
PH	**0.054**	-0.04	-0.039	0.117	-0.046	0.009	-0.096	0.014	-0.039	0.046	0.361	-0.011	-0.066	0.493	-0.066	0.027	0.718*
EH	0.044	**-0.049**	-0.05	0.137	-0.051	0.01	-0.118	0.019	-0.028	0.082	0.52	-0.012	-0.061	0.574	0.047	0.017	0.082
DFI(M)	0.017	-0.02	**-0.123**	0.302	-0.135	0.023	-0.192	0.002	-0.028	0.095	0.335	-0.012	-0.027	0.321	0.086	0.034	0.679*
DFI(F)	0.02	-0.021	-0.117	**0.32**	**-0.129**	0.024	-0.206	0	-0.041	0.104	0.363	-0.015	-0.031	0.356	0.098	0.034	0.758*
D50%M	0.017	-0.017	-0.113	0.28	**-0.147**	0.024	-0.184	0	-0.014	0.093	0.257	-0.011	-0.018	0.223	0.085	0.033	0.508
D50%F	0.018	-0.018	-0.107	0.284	-0.131	**0.027**	-0.193	0	-0.02	0.106	0.264	-0.015	-0.026	0.269	0.055	0.029	0.541
DM	0.019	-0.021	-0.088	0.244	-0.101	0.019	**-0.27**	0.013	0.004	0.106	0.114	-0.005	0.002	0.2	-0.006	0.092	0.322
EL	0.017	-0.022	-0.006	-0.002	0.002	0	-0.081	**0.043**	-0.033	0.149	0.37	-0.039	-0.125	0.338	0.02	-0.061	0.57
Row/ear	0.021	-0.014	-0.034	0.128	-0.02	0.005	0.01	0.014	**-0.102**	0.032	0.164	-0.022	-0.047	0	0.184	0.066	0.385
1000GW	0.018	-0.03	-0.087	0.244	-0.101	0.021	-0.21	0.047	-0.024	**0.136**	0.558	-0.036	-0.099	0.528	0.035	0.004	0.004
EW	0.048	-0.062	-0.101	0.282	-0.092	0.017	-0.075	0.039	-0.041	0.184	**0.411**	-0.051	-0.182	0.269	0.315	0.043	0.006
SG	0.006	-0.006	-0.015	0.047	-0.016	0.004	-0.014	0.017	-0.022	0.049	0.206	**-0.101**	-0.027	0.462	-0.158	-0.033	0.4
CD	0.023	-0.02	-0.022	0.065	-0.017	0.004	0.003	0.035	-0.031	0.088	0.488	-0.018	**-0.153**	0.361	0.153	-0.006	0.955**
BY	0.066	-0.069	-0.097	0.279	-0.08	0.018	-0.132	0.036	0	0.176	0.271	-0.114	-0.136	**0.408**	0.024	0.099	0.897
HI	-0.009	-0.006	-0.028	0.082	-0.033	0.004	0.004	0.002	-0.049	0.013	0.339	0.042	-0.061	0.025	**0.382**	-0.028	0.778
PR	0.01	-0.006	-0.028	0.072	-0.033	0.005	-0.167	-0.018	-0.045	0.004	0.12	0.022	0.006	0.272	-0.071	**0.149**	0.996

Residual-0.0461

Note: PH= Plant Height, EH=Ear Height from ground, DFI(M)=Days to male flower initiation, DFI(F)=Days to female flower initiation,D50%M=Days to 50% male flower initiation,D50%F=Days to 50%female flower initiation, DM=Days to maturities, EL=Ear Length, Rows/ear=No. of rows per ear, 1000GW= 1000 kernel weight, EW=Ear weight, SG=Stem Girth, CD=Cob Diameter, BY=Biological yield, HI= Harvest Index, PR= Prop roots, GYPP= Grain yield per plant.

that the character not taken into consideration were also has worth contribution towards higher yield.

CONCLUSION

The massive variation have to be found in important yield contributing traits *viz.* grain yield per plant ranged from 149.43 to 232.83 with a grand mean of 456.06 while biological yield ranged from 127.73 to 675.33 with a grand mean of 241.5. However trait ear weight has to be fond and ranged from 69 to 304.9 with a grand mean of 110.29. The minimum (149.43) and maximum (232) value were recorded for the trait plant height recorded with a grand mean of 174.14 among the maize accessions. Similarly, minimum (126.11) and maximum (107.8) value were recorded with a grand mean of 101.02). for the trait days to maturity. Correlation coefficient is a measure of degree and direction of linear relationship in between two variables. Many economically important traits of plants are usually related to one another in one or several ways. In present investigation, grain yield exhibited positive and highly significant correlation with ear height, days to female flower initiation, days to 50% male flower initiation, days to 50% female flower initiation, days to maturity, 1000 grain weight, ear weight at genotypic and phenotypic level. These traits have to be used in maize improvement programme. Path analysis indicated that the character ear height (0.410) recorded highest of the direct effect followed by biological yield per plant (0.408), harvest index (0.328), days to female flower initiation (0.32), prop root (0.149) and 1000 kernel weight (0.136), so such traits may be rewarding and they should be given importance while practicing selection, aimed at improving grain yield per plant in maize. The genotypes JLM 22 was to be found best for high yield by considering all yield contributing traits followed by JLM 51, HKI 1344, CML 429, CML 470, JLM 30 JLM 2 and these can be utilized in further breeding programmes for producing single cross hybrids in Maize.

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