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Correlation and path coefficient analysis of different maize genotypes under rainfed condition

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Abstract
The current study was conducted at the Research Farm of the School of Agriculture, Abhilashi University, Mandi (H.P) during the kharif season 2023 with three replication in RBD under rainfed condition to assess 24 maize genotypes procured from NBPGR regional station Shimla and 5 local cultivar collected from different area of the Mandi district. To ascertain the relationship between various features and their direct and indirect impacts on the amount of seed produced per plant, genotypic and phenotypic correlation coefficients as well as path coefficients were determined. At genotypic and phenotypic level trait grain yield per plant showed positive and significant correlation with number of kernel row per cob, number of kernel per row, number of kernel per cob, 100 kernel weight (g), shelling %. Path coefficient analysis revealed that the highest positive direct effect on grain yield was contributed by number of kernel per cob, number of kernel per row, number of kernel row per cob, 100 kernel weight (g), shelling % had high positive direct effect on grain yield per plant.

Keywords: Correlation coefficient, grain yield, path coefficient, genotypic and phenotypic

Introduction

Maize (*Zea mays* L.) is one of the third important cereal crop in India next to rice and wheat. Maize is also known as the queen of cereals originated from the Andean region of South America. It is tall, monoecious, cross pollinating, diploid cereal (2n=2x=20) of family *Poaceae*. Most researchers believed that the progenitor of cultivated maize is teosinte. Wild species of maize are *Zea mexicana* (2n = 20). *Zea perennis* (2n = 40). *Zea luxurians* (2n = 20), *lea diploperennis* (2n = 20). Maize is highly cross-pollinated species. It was also one of the first plant species identified to photosynthesize by C_4 path way with high yield potential.

The highest genetic diversity of maize is found in Southern America. The term **"**corn**"** is derived from Indo-European word means **'**small nugget**'**. After rice and wheat, maize is the third most significant cereal for human consumption. Most of India's states farm it year-round for a variety of uses, such as grain, fodder, green corn, popcorn, sweet corn, baby corn, starch, and industrial products. It is grown during the three distinct seasons of *Zaid* (summer), *Rabi* (winter), and *Kharif* (rainy).

The United States produces about 40% of the world's maize crop, with India accounting for just 2% of total production. In terms of global maize production, India is ranked sixth. In India, 85% of the land is covered in the *summer, kharif, and spring*, and the remaining 15% is covered in *rabi* in the states of AP, TN, KR, MH, BH, and WB. In addition to being a strong source of iron, phosphate, and vitamin B complex, maize is high in proteins and carbs Grain maize has 10% protein, 4% oil, 70% carbs, 3.5 percent fiber, 5% fat, and 2% minerals. Numerous essential vitamins, including provitamin A, or the precursor to vitamin A, folic acid, vitamin C, and vitamin B are found in maize. Along with being low in calcium and potassium, maize is also high in manganese, phosphorus, magnesium, zinc, copper, iron, and selenium. But maize is naturally deficient in tryptophan and lysine, which are two out of ten amino acids that are considered essential to humans. Moreover, it provides a significant supply of livestock feed. Silage is prepared from green maize plants. Maize also serves as poultry and piggery feed. It provides up to 15% of the protein in the world and 19% of the calories from food crops. Globally, it has been estimated that approximately 21% of the total grain produced is consumed as food. 80% of maize in India is taken in *kharif* (monsoon) season. Winter and spring maize are almost entirely irrigated. In *kharif* season 3-5 irrigations are required.

In world, America's continent still has the biggest production with 564 million tonnes or contributing 49.2% of the world's corn production. Asia become the second biggest maize production with 369 million tons or contributing 32.1% of corn production. Europe is the third with 132 million tons or contributing 11% of the world's corn production. Africa is the fourth with 81 million tons or contributing 7.1% of the world's corn production. (Source: FAOSTAT, 2022).

In India, *kharif* maize has been sown in around 85.79 lakh hectares (212 lakh acres) as on 29th September 2023which is higher than 82.61 lakh hectares (204.15 lakh acres) covered during corresponding period of last year. Major maize growing states are Madhya Pradesh 17.44 lakh ha (43.10 lakh acres), Karnataka 16.09 lakh ha (39.77 lakh acres), Rajasthan 9.42 lakh ha (23.28 lakh acres), Maharashtra 9.16 lakh ha (22.64 lakh acres), Uttar Pradesh 7.63 lakh ha (18.86 lakh acres), Bihar 3.41 lakh ha (8.45 lakh acres), Gujarat 2.82 lakh ha (6.98 lakh acres), Himachal Pradesh 2.38 lakh ha (5.88 lakh acres), Odisha 2.68 lakh ha (6.63 lakh acres) and Telangana 2.21 lakh ha (5.46 lakh acres). According to 3rd Advance Estimates of Production of Food grains for 2022-23, all India Maize production estimate was 35.91 million tonnes. (Agricoop, 2023). In Himachal Pradesh, maize grown under area of 255.539 hectare in 2022-23 with production of 708.42 metric tons and productivity of 2772.24 kg/ha. (Department of agriculture, Himachal Pradesh, 2023).

The correlation coefficient analysis is useful in the identification of such characters and elimination of those with undesirable correlated components. Path analysis partitions the estimated correlations in direct and indirect effects of traits on a basic variable. It is a standardized partial regression coefficient and measures the direct influence of a predicted variable on the response variable (Mohammadi *et al*. 2003) [16]. Thus, knowledge of genetic variability, correlation and path coefficient is essential for a breeder to choose the best genotypes and decide the correct methodology for crop improvement.

Materials and Methods

The experiment was conducted during *kharif* season, 2023 at the Research Farm of School of Agriculture, Abhilashi University (H.P). The experimental farm is situated at 31^{0}.559'155'' latitude and 77^{0}.009'466'' longitude at an elevation of 2065 meter. Agro-climatically, the location represent the mid hill zone of Himachal Pradesh (Zone II) and is characterized by humid sub humid- temperate climate with high mean annual rainfall (1600-1800mm). The soil is acidic in nature with pH ranging from 5.0 to 5.6 and soil texture is silty clay loam. In total 29 genotypes which included 20 IC collections, 4 EC collections, along with 5 local landraces were evaluated in RBD design with three replications. The source of germplasm is given in (Table 1).

Table 1: The source of germplasm

Number of Genotypes	29
Design	RBD
Replications	3
Spacing	60-75×20 Cm
Seed rate	20kg/ha
Date of sowing	09-06-2023
Date of harvesting	05-10-2023

Table 2: List of accessions and source of maize accession

Sr. No.	Accession	Source
1.	IC-327004	NBPGR Shimla
2.	IC-327007	NBPGR Shimla
3.	IC-327008	NBPGR Shimla
4.	IC-396861	NBPGR Shimla
5.	IC-396881	NBPGR Shimla
6.	IC-396884	NBPGR Shimla
7.	IC-328586	NBPGR Shimla
8.	IC-471196	NBPGR Shimla
9.	IC-550355	NBPGR Shimla
10.	IC-328587	NBPGR Shimla
11.	IC-77395	NBPGR Shimla
12.	IC-220226	NBPGR Shimla
13.	IC-200247	NBPGR Shimla
14.	IC-200218	NBPGR Shimla
15.	IC-278618	NBPGR Shimla
16.	IC-253994	NBPGR Shimla
17.	IC-200272	NBPGR Shimla
18.	IC-253939	NBPGR Shimla
19.	IC-200309	NBPGR Shimla
20.	IC-200249	NBPGR Shimla
21.	EC-596652	NBPGR Shimla
22.	EC-620051	NBPGR Shimla
23.	EC-583163	NBPGR Shimla
24.	EC-583166	NBPGR Shimla
25.	Shriram Bio-605	Sundernagar
26.	Nutranta	Sundernagar
27.	Dhamber	Chachyot
28.	White Maize	Chachyot
29.	Karsog Local	Karsog

Results and Discussion

Estimates of correlation coefficient at phenotypic and genotypic levels

Phenotypic Correlation

At phenotypic level grain yield show significantly positive correlation with number of kernel row per cob, number of kernel per row, number of kernel per cob, 100 kernel weight (g), shelling %. Days to 50% silking were positively correlated with days to 50% tasseling and negative correlation with number of kernel per row, shelling percent (%). Days to 50% tasseling showed negative significant correlation with number of kernel per row, shelling percent (%). Plant height (cm) showed positive significant correlation with ear height (cm), number of leaves per plant, number of kernel row per cob and negative correlation with length of cob (cm). Ear height significant and positive correlation with number of leaves per plant and negative correlation with number of kernel per cob. Number of kernel row per cob showed significant and positive correlation with number of kernel per row, number of kernel per cob, shelling percent (%), yield per plant (g). Number of kernel per row showed significant and positive correlation with number of kernel per cob, shelling percent (%), yield per plant (g). Number of kernel per cob manifested positive and significant correlation with shelling percent (%), yield per plant (g). 100 kernel weight (g) showed significant and positive correlation with yield per plant (g). Shelling percent (%) manifested positive and significant correlation with yield per plant (g).

Table 3: Phenotypic correlation coefficient between grain yield and yield contributing traits in maize

Phenotypic Correlation Matrix												
	Days to 50% silking	**Days to 50% tasseling**	**Plant height (cm)**	**Ear height (cm)**	**No. of leaves per plant**	**Length of cob (cm)**	**No. of kernel row per cob**	**No. of kernel per row**	**No. of kernel per cob**	**100 kernel weight (g)**	**Shelling percent (%)**	**Yield per plant (g)**
Days to 50% silking		0.813**	-0.2069	-0.0992	0.0626	0.0685	-0.0879	-0.311*	-0.1415	0.0182	-0.222*	-0.1218
Days to 50% tasseling			-0.1228	-0.0119	0.1054	0.0468	-0.1987	-0.310*	-0.1879	-0.0891	-0.264*	-0.171
Plant height (cm)				0.774**	0.268*	-0.227*	0.285*	0.1075	-0.0433	-0.0141	0.1228	-0.0444
Ear height (cm)					0.355**	-0.1544	0.0653	-0.0294	-0.217*	-0.1154	0.0433	-0.1953
No. of leaves per plant						-0.0463	0.0412	-0.0306	-0.0606	-0.0143	0.0049	0.0079
Length of cob (cm)							0.0249	-0.0424	0.0727	0.1248	0.0231	0.0348
No. of kernel row per cob								0.515**	0.412**	0.1038	0.310*	0.490**
No. of kernel per row									0.549**	0.1322	0.350**	0.629**
No. of kernel per cob										0.0936	0.450**	0.846**
100 Kernel weight (g)											0.1194	0.292*
Shelling percent (%)												0.469**
Yield per plant (g)												

Similar result were showed by Mahmood *et al*. (2004) [15] carried out phenotypic correlations were ascertained for grain yield and its components. Grain weight showed positive correlation with grain yield plant^{-1}. El-Shouny *et al.* (2005) [6] estimate phenotypic correlations and showed that grain yield per plant correlated positively and significantly with number of kernels per row, 100 kernel weight, number of rows per ear. Rafiq *et al.* (2010) [25] reported that 100-grain weight, rows per ear and grains per row were significantly correlated with grain yield. Reddy *et al*. (2012) [28] determined that grain yield was positively and significantly associated with 100-seed weight, number of kernels per row, plant height, number of kernel row per ear. Mural *et al*. (2012) [20] reported that the correlation between grain yield and its components in which the number of kernel rows per cob, number of kernels per row, test weight, shelling percentage positive association with grain yield. Mohan *et al*. (2014) [17] conducted to assess the magnitude of genetic variability in QPM for morphological and quality traits. Seed yield per plot followed by 1000 grain weight and number of grains per row had high estimates of phenotypic coefficient of variation (PCV). Kumar *et al.* (2015) [13] determined the positive and significant phenotypic correlations were recorded for grain yield with number of kernel row per ear and kernels per row and 100 kernels. Bartaula *et al*. (2019) [4] studied that grain yield showed positive and significant phenotypic correlation with test weight (r=0.960), kernel per row (r=0.924), kernel rows per cob (r=0.900) and cob length (r=0.840), respectively. Traits namely grain yield, number of kernels per cob and kernel rows per cob showed high GCV, PCV. Magar *et al*. (2021) [14] studied grain yield showed positive and significant phenotypic correlation with number of rows per cob (r=0.539).

Genotypic Correlation

Table 4: Genotypic correlation coefficient between grain yield and yield contributing traits in maize

Genotypic Correlation Matrix												
	Days to 50% silking	**Days to 50% tasseling**	**Plant height (cm)**	**Ear height (cm)**	**No. of leaves per plant**	**Length of cob (cm)**	**No. of kernel row per cob**	**No. of kernel per row**	**No. of kernel per cob**	**100 kernel weight (g)**	**Shelling percent (%)**	**Yield per plant (g)**
Days to 50% silking		0.923**	-0.300*	-0.1022	0.187	0.0514	-0.512**	-0.432**	-0.299*	-0.252*	-0.868**	-0.287*
Days to 50% tasseling			-0.1164	0.1013	0.270*	-0.084	-0.333*	-0.394**	-0.307*	-0.290*	-0.757**	-0.247*
Plant height (cm)				0.894**	0.405**	-0.262*	0.358**	0.1025	-0.0388	0.096	0.246*	-0.0267
Ear height (cm)					0.519**	-0.0536	0.2091	-0.0989	-0.279*	0.0635	-0.1462	-0.2069
No. of leaves per plant						-0.214*	0.1222	-0.1022	-0.1338	-0.0272	-0.0746	-0.0227
Length of cob (cm)							0.0148	0.0813	0.1143	0.0228	0.1514	-0.0053
No. of kernel row per cob								0.914**	0.642**	0.1612	0.688**	0.766**
No. of kernel per row									0.658**	0.1984	0.714**	0.775**
No. of kernel per cob										0.1116	0.798**	0.909**
100 Kernel weight (g)											0.1158	0.305*
Shelling percent (%)												0.778**
Yield per plant (g)												

At genotypic level grain yield showed significant and positive correlation with number of kernel row per cob, number of kernel per row, number of kernel per cob, 100 kernel weight (g), shelling percent (%) and negative correlation with days to 50% silking and days to 50% tasselling. Days to 50% silking were positively correlated with days to 50% tasseling and negative correlation with plant height (cm), number of kernel per row, number of kernel per row, number of kernel per cob, 100 kernel weight (g) shelling percent (%), yield per plant (g). Days to 50% tasselling manifested positive and significant correlation with number of leaves per plant and negative correlation with number of kernel per row, number of kernel per row, number of kernel per cob, 100 kernel weight (g) shelling percent (%), yield per plant (g).Plant height (cm) showed positive significant correlation with ear height (cm), number of leaves per plant, number of kernel row per cob, shelling percent (%) and negative correlation with length of cob (cm).Ear height significant and positive correlation with number of leaves per plant and negative correlation with number of kernel per cob. Number of leaves per plant significant and negative correlation with length of cob (cm). Number of kernel row per cob showed significant and positive correlation with number of kernel per row, number of kernel per cob, shelling percent (%), yield per plant (g). Number of kernel per row showed significant and positive correlation with number of kernel per cob, shelling percent (%), yield per plant (g)**.** Number of kernel per cob manifested positive and significant correlation with shelling percent (%), yield per plant (g). 100 kernel weight (g) showed significant and positive correlation with yield per plant (g). Shelling percent (%) manifested positive and significant correlation with yield per plant (g).

Similar result were reported by Yousuf and Saleem (2001) [34] estimate the genotypic and phenotypic correlation coefficients among various plant traits. Grain yield per plant showed significant genotypic correlation with number of kernel rows per ear and number of kernels per row. Correlation analysis showed that indirect selection for grain yield is possible through selection for number of kernel rows per ear and 100-grain weight. Khumkar and Singh (2004a) [11] concluded that maximum direct positive effect on grain yield at genotypic level which was followed by number of kernels per row and number of kernel rows per cob. On the other hand, days to 50% tasseling had maximum direct negative effect. Mahmood *et al*. (2004) [15] carried out Genotypic correlations were ascertained for grain yield and its components. Grain weight showed positive correlation with grain yield plant^{-1}. Sadek *et al*. (2006) [29] reported that yield was positively and significantly correlated with number of kernels per row, 100- seed weight. On the contrary, days to 50% tasseling, days to 50% silking and days to maturity are negatively correlated with grain yield. Jawaharlal *et al*. (2011) [8] studied character days to 50% tasselling and days to 50% silking exhibited significant negative genotypic correlation with grain yield. Mural *et al*. (2012) [20] reported that the correlation between grain yield and its components in which number of kernel rows per cob, number of kernels per row, test weight, shelling percentage and protein content showed significant positive association with grain yield, while days to 50% tasseling, days to anthesis, days to 50% silking showed significant negative association with grain yield. Muneeb *et al*. (2013) [19] investigated the genotypic and phenotypic association among grain yield components and their direct and indirect effects on yield. Correlation studies revealed significant positive genotypic and phenotypic relationship of grain yield with rows per cob and grains per row. Mohan *et al*. (2014) [17] conducted to assess the magnitude of genetic variability in QPM for morphological and quality traits. Seed yield per plot followed by 1000 grain weight and number of grains per row had high estimates of genotypic coefficient of variation (GCV). Tulu (2014) [31] reported that grain yield showed positive and highly significant correlations with most traits at phenotypic and genotypic levels. Number of kernels per row exerted positive direct effect and also had positive association with grain yield. Rani and Niral (2015) [27] reported the positive and significant correlations for number of kernel rows per ear, 1000-grain weight with grain yield. Negative and significant correlation was found for days to 50% silk with grain yield. Ferdoush *et al*. (2017) [7] studied correlation co-efficient analysis revealed that yield plant^{-1} (g) had positive and significant association with 1000-kernel weight (g), yield plot^{-1} (g), grain yield (tha^{-1}) with dry weight. Rai *et al*. (2021) [26] studied grain yield showed a significant and positive correlation with kernels' rows ear^{-1}, and kernels row^{-1}. Mohanapriya *et al*. (2023) [18] the correlation studies revealed that yield is harmonized positively with all the yield attributes and negatively associated with Anthesis silking interval (ASI).

Estimates of direct and indirect effects at phenotypic (P) and genotypic (G) levels

Path coefficient analysis at phenotypic level showed significant positive correlation of grain yield with five traits viz., number of kernel row per cob, number of kernel per row, number of kernel per cob, 100 kernel weight (g), shelling percent (%) while negative association, was not found with any traits (Table 5)

Table 5: Phenotypic path analysis for grain yield and yield components maize

Phenotypic Path Matrix											
	Days to 50% silking	**Days to 50% tasseling**	**Plant height (cm)**	**Ear height (cm)**	**No. of leaves per plant**	**Length of cob (cm)**	**No. of kernel row per cob**	**No. of kernel per row**	**No. of kernel per cob**	**100 kernel weight (g)**	**Shelling percent (%)**	**Yield per plant (g)**
Days to 50% silking	-0.0453	-0.0369	0.0094	0.0045	-0.0028	-0.0031	0.004	0.0141	0.0064	-0.0008	0.0101	-0.1218
Days to 50% tasseling	0.0713	0.0878	-0.0108	-0.001	0.0093	0.0041	-0.0174	-0.0272	-0.0165	-0.0078	-0.0232	-0.171
Plant height (cm)	0.0272	0.0161	-0.1313	-0.1017	-0.0352	0.0298	-0.0374	-0.0141	0.0057	0.0019	-0.0161	-0.0444
Ear height (cm)	-0.0031	-0.0004	0.0242	0.0312	0.0111	-0.0048	0.002	-0.0009	-0.0068	-0.0036	0.0014	-0.1953
No. of leaves per plant	0.0041	0.0069	0.0176	0.0233	0.0655	-0.003	0.0027	-0.002	-0.004	-0.0009	0.0003	0.0079
Length of cob (cm)	-0.0041	-0.0028	0.0135	0.0092	0.0028	-0.0595	-0.0015	0.0025	-0.0043	-0.0074	-0.0014	0.0348
No. of kernel row per cob	-0.0115	-0.0259	0.0371	0.0085	0.0054	0.0032	0.1304	0.0672	0.0538	0.0135	0.0404	0.490**
No. of kernel per row	-0.0536	-0.0533	0.0185	-0.0051	-0.0053	-0.0073	0.0887	0.1721	0.0945	0.0227	0.0602	0.629**
No. of kernel per cob	-0.0941	-0.1249	-0.0288	-0.144	-0.0403	0.0483	0.2742	0.365	0.665	0.0622	0.299	0.846**
100 Kernel weight (g)	0.0037	-0.0181	-0.0029	-0.0235	-0.0029	0.0254	0.0211	0.0269	0.019	0.2033	0.0243	0.292*
Shelling percent (%)	-0.0164	-0.0196	0.0091	0.0032	0.0004	0.0017	0.0229	0.0259	0.0333	0.0088	0.0741	0.469**
Yield per plant (g)	-0.1218	-0.171	-0.0444	-0.1953	0.0079	0.0348	0.490**	0.629**	0.846**	0.292*	0.469**	

Residual effect =0.2108114 * Significant at $p<0.05$

Residual effect =0.346782284 ** Significant at $p<0.01$

Table 6: Genotypic path analysis for grain yield and yield components maize

Genotypic Path Matrix												
	Days to 50% silking	**Days to 50% tasseling**	**Plant height (cm)**	**Ear height (cm)**	**No. of leaves per plant**	**Length of cob (cm)**	**No. of kernel row per cob**	**No. of kernel per row**	**No. of kernel per cob**	**100 kernel weight (g)**	**Shelling percent (%)**	**Yield per plant (g)**
Days to 50% silking	0.1094	0.1182	-0.0329	-0.0112	0.0205	0.0056	-0.056	-0.0473	-0.0328	-0.0276	-0.095	-0.287*
Days to 50% tasseling	-0.1476	-0.1367	0.0159	-0.0138	-0.0369	0.0115	0.0455	0.0539	0.0419	0.0396	0.1035	-0.247*
Plant height (cm)	-0.1767	-0.0685	0.5883	0.5261	0.2383	-0.1539	0.2105	0.0603	-0.0229	0.0565	0.145	-0.0267
Ear height (cm)	0.096	-0.0951	-0.8397	-0.939	-0.487	0.0503	-0.1963	0.0928	0.2618	-0.0596	0.1373	-0.2069
No. of leaves per plant	0.0291	0.042	0.063	0.0807	0.1556	-0.0333	0.019	-0.0159	-0.0208	-0.0042	-0.0116	-0.0227
Length of cob (cm)	0.0063	-0.0103	-0.0322	-0.0066	-0.0263	0.1229	0.0018	0.01	0.0141	0.0028	0.0186	-0.0053
No. of kernel row per cob	-0.52	-0.3381	0.3634	0.2123	0.1241	0.0151	1.0155	0.9281	0.6521	0.1637	0.699	0.766**
No. of kernel per row	0.2029	0.185	-0.0481	0.0464	0.0479	-0.0381	-0.4289	-0.4692	-0.3087	-0.0931	-0.3348	0.775**
No. of kernel per cob	-0.1869	-0.1916	-0.0243	-0.1741	-0.0836	0.0714	0.401	0.4108	0.6245	0.0697	0.4981	0.909**
100 Kernel weight (g)	-0.0515	-0.0592	0.0196	0.013	-0.0056	0.0047	0.0329	0.0405	0.0228	0.2043	0.0237	0.305*
Shelling percent (%)	0.3521	0.307	-0.0999	0.0593	0.0302	-0.0614	-0.2791	-0.2893	-0.3234	-0.0469	-0.4055	0.778**
Yield per plant (g)	-0.287*	-0.247*	-0.0267	-0.2069	-0.0227	-0.0053	0.766**	0.775**	0.909**	0.305*	0.778**	

Residual effect =0.2108114 * Significant at $p<0.05$
Residual effect =0.346782284 ** Significant at $p<0.01$

At genotypic level grain yield showed significant positive correlation with five traits viz., number of kernel row per cob, number of kernel per row, number of kernel per cob, 100 kernel weight (g), shelling percent (%) while negative association was found in days to 50% silking, days to 50% tasseling (Table 6).

Similar result were showed by Vaezi *et al*. (2000) [33] noticed that grain yield was significantly and positively correlated to kernels weight and number of kernels per row. Path analysis for grain yield showed that kernel weight. Umakanth and Khan (2001) [33] observed path analysis revealed that plant height followed by number of seeds per row, 100 seed weight showed maximum positive direct genotypic effects as well as indirect contribution through other characters on grain yield. Kumar *et al*., (2006) [12] reported that the grain yield had positive and significant correlation with kernel rows per ear and 100-seed weight both at genotypic and phenotypic levels. Path analysis revealed that the days to 50% silking exhibited negative direct effect on grain yield, however, influenced the yield indirectly through days to 50% tasselling. Sofi and Rather (2007) [30] reported that the path analysis indicated that 100-seed weight had the greatest direct effect on grain yield, followed by number of kernels per row, number of kernel rows per ear. Pavan *et al*. (2011) [23] studied path analysis was used to partition the genetic correlations between grain yield and related characters. 100-grain weight, total number of kernels per ear showed positive direct effect on grain yield. Kanagarasu *et al*. (2013) [9] carried a study to estimate the various genetic parameters and nature of association among the traits influencing maize grain yield. Genotypic correlation coefficients and path analysis revealed that grains/row, grain rows/cob, 100 grain weight and had positive significant correlation and highest direct effect on grain yield. Nataraj *et al*. (2014) [21] studied phenotype as well as genotype correlation and path analysis of agronomic yield and yield contributing characters were analysed in 39 inbreds of maize (*Zea mays* L.). Grain yield has positive and significant correlation with number of kernels per row, number of kernels rows per ear, 100 grain weight at genotypic and phenotypic levels. Path analysis revealed that number of kernel rows per ear, number of kernels per row and 100 grain weight showed highest direct effect on grain yield per plant. Patil *et al*. (2016) [22] carried out path analysis studies revealed that days to numbers of kernel row per cob and 100 grain weight exhibited high direct effects on grain yield indicating true and perfect relationship between them. Beulah *et al*. (2018) [5] carried the path analysis results showed 100 seed weight exhibited the positive direct effect on grain yield. Prakash *et al*. (2019) [24] studied the path analysis for the attributed traits revealed the direct influence of cob girth followed by number of kernels per row, shelling percentage on grain yield. Khan and Mahmud (2021) [10] In path analysis study, positive direct correlation was recorded in number of grains per cob (6.874) and 100-seed weight (0.595).

Conclusions
At phenotypic level trait grain yield per plant showed positive and significant correlation with number of kernel row per cob, number of kernel per row, number of kernel per cob, 100 Kernel weight (g), shelling %. At genotypic level grain yield per plant showed significant positive correlation with number of kernel row per cob, number of kernel per row, number of kernel per cob, 100 kernel weight (g), shelling percent (%). Path coefficient analysis revealed that the highest positive direct effect on grain yield was contributed by number of kernel per cob, number of kernel per row, number of kernel row per cob, 100 kernel weight (g), shelling % had high positive direct effect on grain yield per plant. These characters also had the highest direct and indirect effects through most of the characters. It is therefore concluded that these agronomic parameters could be considered as important selection criteria in improving synthetic maize varieties for high grain yield.

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