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TRAIT ASSOCIATION AND PATH ANALYSIS IN MAIZE (*ZEA MAYS* L.) VARIETIES FOR GROWTH AND YIELD TRAITS

Kruti Rajendra Prabhu[1], Chandan Kumar Panigrahi[2], Sujeela Rani[3], Dhamni Patyal[4], Mouli Paul[5], Khushboo Sharma[6], Aman Tutlani[1,7], Ajaz A. Lone[8], Z.A. Dar[8] and I.R. Delvadiya[1*]

[1]Department of Genetics and Plant Breeding, School of Agriculture, Lovely Professional University, Phagwara-144411, Punjab, India.
[2]Department Of Entomology, Faculty of Agricultural Sciences, Siksha 'O' Anusandhan, Deemed to be University, Bhubaneswar – 751029, Odisha, India.
[3]Department of Genetics and Plant Breeding, Faculty of Agriculture, Chatha, Sher-e-Kashmir University of Agricultural Sciences and Technology, Jammu- 180009, India.
[4]Department of Agronomy, Sher-e-Kashmir University of Agriculture sciences and Technology Jammu-180009, India.
[5]Department of Genetics and Plant Breeding, Ramakrishna Mission Vivekananda Educational and Research Institute, Kolkata, India.
[6]Divison of Vegetable Science, Sher-e Kashmir University of Agricultural Science and Technology, Srinagar, Jammu & Kashmir, India.
[7]Division of Genetics and Plant Breeding, Sher-e Kashmir University of Agricultural Science and Technology, Srinagar, Jammu & Kashmir, India.
[8]Dryland Agriculture Research Station, Rangreth, Srinagar, Jammu & Kashmir- 190017, India.
*Corresponding author E-mail: indrajaydelvadiya@gmail.com

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ABSTRACT

The present study was carried out in *rabi* season in 2023 at agricultural farm department of genetics and plant breeding Lovely professional university, Jalandhar, Punjab in randomized block design with three replication and data were recorded on various yield and yield components to estimate character association and path analysis among 28 maize genotypes (*Zea mays* L.) for eleven yield and yield attributing characters. The phenotypic and genotypic correlation coefficients were worked out to assess the direction and magnitude of association existing between yield and yield components. the present investigation recorded a genotypic correlation are grain yield per plant was positively with all nine traits *viz.,* days to 50% silking, days to maturity, plant height, ear height, ear length, ear girth, number of kernels per ear, number of kernels per row and 100 kernels per weight. Whereas, days to 50% tasseling were negatively correlated. Phenotypic correlation was highest positive direct effect on yield per plant were exerted by number of days to 50% silking, days to maturity, ear height, ear girth, number of kernels per ear are positive direct effect and remaining character *viz.,* days to 50% tasseling, Plant height, ear length, number of kernels per row, 100 kernels weight are negative direct effect recorded. Path coefficient analysis revealed that the positive direct effect on grain yield was noticed for number of grains per row followed by 100-grain weight, ear length, plant height, ear girth, harvest index, days to 50 % silking, number of grain rows per ear, days to 50 per cent brown husk. On contrary, the traits *viz.,* days to 50% tasseling, number of cobs per plant and ear height exhibited negative direct effects on grain yield per plant. That all research to conclude that a Greenfarm, Hybrid makka 1 as well bajaura popcorn are significantly better performance that's why those are used to early mature variety for breeding programme as well high yield better parents are considering to this research Hybrid makka 1, Hemma NAH 1137 to be better all of listed genotypes. Therefore, the traits number of grains per row, ear length, ear girth and 100-grain weight could be considered as the major yield contributing characters in maize and hence, emphasis should be made on these traits in the selection programme to evolve high yielding genotypes in maize.

***Keywords*:** Path analysis, grain yield, tasseling, maize, phenotypic and genotypic correlation.

Introduction

Maize (*Zea mays* L. 2n = 20) is the third most important cereal grain in the world after wheat and rice. Maize is believed to be originated in Gautemala and Southern Mexico. Most researchers believed that the progenitor of cultivated maize is teosinte. Maize belongs to Family *Poaceae* and Genus *Zea*. Globally maize covers an area of 159 million hectares with a production of 796.46 million tonnes (USDA, 2010) and in India maize occupies an area of 7.27 million hectares with a production of 15.86 million tonnes and productivity of 2181 kg/ha (Ministry of Agriculture, 2011 - 12). In Andhra Pradesh, it covers an area of 7.44 lakh hectares with a production of 39.53 lakh tonnes and productivity of 5317 kg/ha. Among the major maize producing states, Andhra Pradesh tops the list with a contribution of 21% to the total Indian maize production followed by Karnataka (15.4%) and Rajasthan (14%) (MOA, Agriculture statistics at a glance, 2010).

Though maize has been used as a staple food crop, now it is gaining importance as livestock feed. Also, due to the high yield potentiality, versatile uses like the grain, leaves, stalks, tassel and can be used to produce a large variety of food and non-food products and provides nutrients for humans and animals and serves as a basic raw material for the production of starch, oil and protein alcoholic beverages, food sweeteners and more recently fuel. Almost year-round growth ability and higher per acre yield than the other cereals, area and production of maize is increasing day by day in the state as well as in the country. Though, many synthetics and composites have contributed to maize production in India in the initial stages of maize improvement programme, of late, hybrids are playing a vital role due to their high yielding potential.

Maize research in India has started during late 1950's and was hybrid oriented till mid-seventies. Later, due to late maturity of hybrids and lack of productive and vigorous inbred lines, population improvement programme started leading to development of synthetics and composites. But again, since a decade or two, hybrid breeding programmes are receiving greater importance. Since the hybrids are more uniform, early maturing, productive and more importantly because of population improvement programme, the productive inbred lines are available. Now a days great advancement has been achieved in maize production, but this is not sufficient to meet the challenge which led upon on us due to opening of our agriculture mark*et al*ong with changing food behaviour of large population. Though many constraints are still confronting which creates a challenging job for the researcher. With the introduction of heterosis concepts in maize by Shull (1952) there has a breakthrough in yield of this crop. Hence it may be viewed with optimism that there is wide scope for further yield improvement and breaking the yield plateau in India through appropriate genetic manipulation, but the choice of appropriate genotypes is of great concern.

A clear understanding of the association between yield and yield components is necessary for successful crop improvement programme, since grain yield is a complex character and is influenced by several genetic factors interacting with environment. Correlation coefficient analysis reveals the magnitude and direction of yield components, while path analysis identifies components which directly or indirectly influences yield. Both character association and path analysis help in formulating an effective breeding strategy to further develop productive inbred in maize. The present research was conducted to estimate genotypic and phenotypic correlations among seed yield and its components and determine the direct and indirect effects of different characters on seed yield using path coefficient analysis.

Materials and Methods

The experiment was conducted out under school of agriculture research farm, Department of genetics and plant breeding, Lovely Professional University, Jalandhar, Punjab. Experimental site is located under Kapurthala district. The experiment was conducted with twenty-eight genotypes with a three replication and those conducted experiment was designed using a randomized complete block design (RCBD). Observations on yield and yield attributing characters were recorded, leaving border plants in each replication. In each plot, five randomly selected competitive plants were tagged to record observations except for days to 50% tasselling and days to maturity which were recorded on plot basis.

In the present study 28 genotypes of the maize (*Zea mays* L.) cultivars as the material was used those are collected from the department of genetics and plant breeding, Lovely professional university, Jalandhar, Punjab and used cultivars for experiment tabulated in Table 1.

Table 1: List of genotypes used in present investigation.

Sr. No.	Genotypes	Sr. No.	Genotypes
1	Ginija composite	15	Hg 55
2	Bajaura sarutm	16	Hybrid Makka 1
3	Bajaura popcorn	17	Hybrid Makka 22
4	lasty composite	18	Sonmati
5	palam sankar makka 2	19	Greenfarm
6	Him palam	20	Gajraj
7	VI-78	21	Palan shankar
8	Bajaura makka	22	Makka 2 CSK
9	Haryali	23	DKC 9164
10	Cbs 568	24	CP 838
11	Ganga	25	Hemma NAH 1137
12	Green makka	26	Shalimar sweetcorn 1
13	Laxmi	27	Shalimar popcorn 1
14	kranti makka	28	PMH-1

Observations on yield and yield attributing characters were recorded for days to 50 per cent tasseling, days to 50 per cent silking, 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), grain yield per plant (g).

Phenotypic correlation coefficient measures the correlation between two traits including both genetic and environmental influences. While genotypic correlation coefficient measures the correlation between two traits due to genetic factors only. When testing the significance of phenotypic and environmental correlation coefficients, the estimated values compared with the tabulated values of Fisher and Yates (1938) at n-2 degrees of freedom at two levels of probability, which are typically 5% and 1%. Direct and indirect effect of traits to the total correlation with grain yield was estimated through path coefficient analysis suggested by Wright (1921, 1935). Later elaborated by Dewey and Lu (1959). Path analysis splits the correlation coefficient into the measures of direct and indirect effects and measures contribution of each independent variable on the dependent variable and estimates residual effects. It helps to determine the yield and yield contributing traits. Path coefficient rated on the scales given by (Lenka and Mishra 1973).

Results and Discussion

Correlation analysis

Yield is a complex character, which is the product of multiplicative interactions of a number of characters (Grafius, 1959). Hence, yield cannot be improved to a greater extent on its own. Yield is influenced by a set of other characters known as yield components which are correlated among themselves and with yield either favorably or unfavorably. The study of genetic correlation gives an idea about the extent to which the characters are under the control of the same set of genes. If the correlation is high, then probably the pleiotrophy is more important, if the correlation is low then it may be inferred that the traits are inherited independently. Hence, knowledge of the association between yield and yield components is essential for effective selection. In the present study also, a number of yield components were investigated and their relationship with yield as well as among themselves was examined using correlation analysis.

The phenotypic and genotypic correlation coefficients were worked out to assess the direction and magnitude of association existing between yield and yield components. The results of genotypic and phenotypic correlation analyses are furnished in Table 2 and Table 3 respectively. In general, genotypic correlations were higher than their corresponding phenotypic correlations for almost all the characters. Further, the magnitude and direction of association of their corresponding phenotypic and genotypic correlations were also matched.

In the present investigation recorded a grain yield per plant was positive correlation with all nine traits there a Days to 50% silking, days to maturity, plant height, ear height, ear length, ear girth, number of kernels per ear, number of kernels per row and 100 kernels per weight. Whereas days to 50% tasseling are negative correlation recorded.

Genotypic correlation

Significant correlation analysis revealed that days to 50% tasselling exhibited a highly significant positive correlation with days to 50% silking (0.5102) and a significant negative correlation with days to maturity (-0.5434). Days to 50% silking showed significant negative correlation with days to maturity (-0.4205) and significant positive correlations with ear length (0.4476) and 100-kernel weight (0.4769). Days to maturity was positively and significantly correlated with plant height (0.4222) and ear height (0.4053), while it had a highly significant negative correlation with number of kernels per ear (-0.5944). Plant height showed a highly significant positive correlation with grain yield per plant and was also significantly correlated with ear height (0.9977), ear length (0.5613), ear girth (0.4114), number of kernels per ear (0.4740), and 100-kernel weight (0.3680). Similarly, ear height had a highly significant correlation with grain yield per plant and showed significant associations with ear length (0.5448), ear girth (0.4032), number of kernels per ear (0.4686), number of kernels per row (0.3618), and 100-kernel weight (0.3714). Ear length was significantly correlated with ear girth (0.5802), number of kernels per ear (0.7578), number of kernels per row (0.5151), and 100-kernel weight (0.4649). Furthermore, ear girth was highly and positively correlated with grain yield per plant and significantly related to number of kernels per ear (0.6990), number of kernels per row (0.4221), and 100-kernel weight (0.5397). Number of kernels per ear showed a significant positive correlation with number of kernels per row (0.3902), and 100-kernel weight was also found to be significantly correlated with grain yield per plant.

Phenotypic correlation

Significant correlation analysis revealed that days to 50% silking exhibited a positive and significant correlation with ear length (0.3869) and 100-kernel weight (0.4009). Days to maturity showed a significant positive association with plant height (0.4073) and ear height (0.4007). Plant height was found to be highly and positively correlated with grain yield per plant and significantly associated with ear height (0.9948), ear length (0.5555), ear girth (0.4104), number of kernels per ear (0.4456), number of kernels per row (0.3500), and 100-kernel weight (0.3680). Likewise, ear height showed a highly significant positive correlation with grain yield per plant and was significantly related to ear length (0.5430), ear girth (0.4038), number of kernels per ear (0.4400), number of kernels per row (0.3558), and 100-kernel weight (0.3761). Ear length exhibited a significant positive correlation with ear girth (0.5728), number of kernels per ear (0.7028), number of kernels per row (0.5023), and 100-kernel weight (0.4690). Furthermore, ear girth was highly and positively correlated with grain yield per plant and significantly associated with number of kernels per ear (0.6453), number of kernels per row (0.4056), and 100-kernel weight (0.5408). A significant positive correlation of number of kernels per ear with grain yield per plant and with number of kernels per row (0.3505) was also observed. Lastly, 100-kernel weight showed a significant positive correlation with grain yield per plant.

Further, positive association was observed for plant height with ear height, ear length, ear girth, 100-grain weight and number of grains per row. Ahmed *et al*. (1978) also reported the positive association of plant height with ear length and 100-grain weight. Therefore, these significant positive correlations indicated that, tall stature plants tend to exhibit maximum ear height, maximum ear length, ear girth with a greater number of grains per row and maximum 100-grain weight. Hence, in the present material simultaneous selection through plant height, ear height, ear length, ear girth and 100-grain weight would be effective for yield improvement.

The trait 100- grain weight was positively correlated with most of the traits *viz.*, ear girth, ear length, ear height and plant height. Further, the above-mentioned traits were also positively correlated with yield per plant. In this case, selection would be effective for genotypes with maximum 100- grain weight which would lead to ultimate improvement in yield per plant through improvement in other yield associated traits. Similar results of significant positive association of 100-grain weight were also reported for ear length (Rao, 1986 and Wannows *et al.* 2010); for ear girth (Rao, 1993 and Kumar and Satyanarayana, 2001); and for plant height (Ahmed *et al.* 1978).

Path Co-Efficient analysis

Path coefficient analysis is unique in partitioning the association in to direct and indirect effects *via* other component characters. Hence, correlation in conjugation with path coefficient analysis will give a clear idea of the nature of association between yield and yield attributes and also gives information on relative contribution of various yield components to yield. Hence, in the present study, path coefficients were worked out for various yield attributes in the present material.

In the present study, the phenotypic correlation coefficients between yield and yield components were partitioned to the corresponding direct and indirect effects through path analysis and the results are presented in Table 4 & Fig. 1 and Table 5 & Fig. 2 for genotypic and phenotypic respectively.

Genotypic path co-efficient analysis

Path coefficient analysis revealed that the highest positive direct effects on grain yield per plant were exhibited by days to 50% silking (0.8359), days to maturity (0.1334), ear height (3.9562), ear girth (0.1780), and number of kernels per ear (0.0929). On the contrary, negative direct effects were observed for days to 50% tasseling (-0.2795), plant height (-3.3279), ear length (-0.3681), number of kernels per row (-0.0491), and 100-kernel weight (-0.1290). Among the notable indirect effects, days to 50% tasseling positively influenced grain yield through days to 50% silking (0.4265) and plant height (0.4876), while having negative indirect contributions via ear height (-0.6361) and days to maturity (-0.0725). Days to 50% silking contributed indirectly through plant height (0.0713) and ear girth (0.0612) but was negatively influenced by ear height (-0.2370) and ear length (-0.1648). Days to maturity had strong positive indirect effects via ear height (1.6034) and ear length (0.0925), and notable negative effects through plant height (-1.4051) and number of kernels per ear (-0.0552). Plant height positively influenced yield through ear height (3.9471) and ear girth (0.0732), but had strong negative effects via ear length (-0.2066). Similarly, ear height contributed positively through ear girth (0.0718) and number of kernels per ear (0.0435), but negatively through plant height (-3.3203) and ear length (-0.2006). Traits such as ear length, ear girth, and number of kernels per ear also showed several strong indirect effects through other yield-contributing traits, highlighting their interconnected role in yield determination. Overall, traits with strong direct and indirect effects, especially ear height, days to 50% silking, and plant height, appear to be critical contributors to grain yield improvement in maize.

Phenotypic path co-efficient analysis

In the present study, positive direct effects on grain yield per plant were observed for days to 50% silking (0.3779), plant height (0.1308), ear height (0.5435), and ear girth (0.3657), while number of kernels per ear (-0.2162), though negatively signed, also contributed directly. Conversely, negative direct effects were exerted by days to 50% tasseling (-0.2149), days to maturity (-0.1715), ear length (-0.2251), number of kernels per row (-0.0262), and 100-kernel weight (-0.0746), indicating their suppressive influence on yield. Among the indirect contributors, days to 50% tasseling positively influenced yield through days to 50% silking (0.1318) and number of kernels per ear (0.0203) but showed negative indirect effects through ear height (-0.0367) and ear girth (-0.0365). Days to 50% silking exhibited favorable indirect influence via ear girth (0.0106) and days to maturity (0.0502), but adversely affected yield through ear length (-0.0871) and 100-kernel weight (-0.0299). Days to maturity showed strong positive indirect effects through ear height (0.2178), ear length (0.0352), and number of kernels per ear (0.0767), with negative influences via plant height (-0.0533) and days to 50% silking (-0.1106). Similarly, plant height affected yield positively through ear height (0.5407) and ear girth (0.1501) but negatively through ear length (-0.1251) and number of kernels per ear (-0.0963). Ear height demonstrated notable indirect effects through plant height (0.1302) and ear girth (0.1477), while negatively influenced by number of kernels per ear (-0.0951) and ear length (-0.1223). Positive indirect effects from ear length included days to 50% silking (0.1462) and ear girth (0.2095), whereas ear girth showed strong positive mediation via ear height (0.2195) and days to 50% silking (0.1096). Number of kernels per ear contributed positively through ear height (0.2391) and ear girth (0.2360), and number of kernels per row acted indirectly via ear girth (0.1483) and ear height (0.1934). Finally, 100-kernel weight showed key indirect positive effects through days to 50% silking (0.1515), ear height (0.2044), and ear girth (0.1978). These findings suggest that while some traits impact yield directly, others particularly ear height, ear girth, and days to 50% silking influence yield both directly and indirectly, thus holding considerable potential for selection in breeding programs.

Considering direct effects, high positive direct effect on grain yield was noticed for number of grains per row followed by 100-grain weight, ear length, shelling percentage, plant height, ear girth, harvest index, days to 50 % silking, anthesis-silking interval, number of grain rows per ear, days to 50 per cent brown husk. Similar results were also observed for ear length (Wannows *et al*., 2010); for ear girth (Sofi *et al*., 2007); for number of grains per row (Mohan *et al*., 2002 and Muhammad *et al*., 2010); for 100-grain weight (Firoza, 1999 and Venugopal *et al*. 2003); for number of grain rows per ear (Chinnadurai and Nagarajan, 2011) and for plant height (Venugopal *et al*., 2003). Further, these traits also expressed highly significant positive association with grain yield per plant except days to 50 per cent silking, anthesis-silking interval and days to 50 per cent brown husk these three characters do not show any significant positive association with grain yield per plant. The high direct effects of these traits appeared to be the main factor for their strong association with grain yield per plant. Hence, direct selection for these traits would be rewarding for yield improvement. The traits viz., days to 50 per tasselling, number of cobs per plant and ear height exhibited negative direct effect on grain yield per plant.

Conclusion

The contribution of different traits towards grain yield per plant revealed that the trait number of grains per row influenced grain yield per plant directly and predominantly followed by ear length, ear girth, 100-grain weight, number of grain rows per ear and shelling percentage. Further, the association of these traits with grain yield per plant was also positive and highly significant, indicating the importance of these traits for grain yield improvement in the present material. Besides this, the traits number of grains per row, ear length, ear girth and 100-grain weight also influenced grain yield per plant indirectly in a substantial magnitude through most of the other yield components as evident in the results. This indicated that these traits were the most important traits in influencing grain yield per plant. Thus, selection for a greater number of grains per row, maximum ear length, ear girth and 100-grain weight were a pre- requisite for attaining improvement in grain yield per plant in the present material. In the present study, the residual effect was of high magnitude (0.7376), indicating that some characters which had due weightage in selection for yield improvement are to be included.

Table 2 : Estimates of genotypic correlation between different characters in maize

	DFT	DFS	DM	PH	EH	EL	EG	NKPE	NKPR	100KW	GYP
DFT	1	0.5102**	-0.5434**	-0.1465	-0.1608	0.0299	-0.2734	-0.3471	-0.307	0.1929	-0.1757
DFS		1	-0.4205**	-0.0214	-0.0599	0.4476	0.3438	0.2428	0.0114	0.4769**	0.3283
DM			1	0.4222**	0.4053**	-0.2512	-0.1302	-0.5944**	0.1711	-0.2877	0.1749
PH				1	0.9977**	0.5613**	0.4114**	0.474**	0.36	0.368*	0.5441**
EH					1	0.5448**	0.4032**	0.4686**	0.3618*	0.3714*	0.5339**
EL						1	0.5802**	0.7578**	0.5151**	0.4649**	0.3399
EG							1	0.699**	0.4221**	0.5397**	0.5116**
NKPE								1	0.3902*	0.2973	0.3778*
NKPR									1	0.1513	0.2044
100-KW										1	0.3671*
GYP											1

**, ** indicates Significant and non-significant differences at 5% and 1% levels, respectively.*

DFT -days to 50 per cent tasseling, **DFS** -days to 50 per cent silking, **DM** -days to maturity, **PH**- plant height (cm), **EH** - ear height (cm), **EL** - ear length (cm), **EG** - ear girth (cm), **NKPE** - number of kernel rows per ear, **NKPR** -number of kernels per row, **100KW** -100-kernel weight (g), **GYP** -grain yield per plant (g).

Table 3 : Estimates of Phenotypic correlation between different characters in maize

	DFT	DFS	DM	PH	EH	EL	EG	NKPE	NKPR	100-KW	GYP
DFT	1										
DFS	0.3487	1									
DM	-0.0953	-0.2926	1								
PH	-0.0669	-0.0149	0.4073	1							
EH	-0.0676	-0.0423	0.4007	0.9948**	1						
EL	0.1075	0.3869	-0.1565	0.5555**	0.543**	1					
EG	-0.0997	0.2900	-0.0271	0.4104**	0.4038**	0.5728**	1				
NKPE	-0.0941	0.2246	-0.3546	0.4456**	0.4400**	0.7028**	0.6453**	1			
NKPR	-0.1859	0.0342	0.1851	0.3500	0.3558	0.5023**	0.4056**	0.3505	1		
100-KW	0.2219	0.4009	-0.1964	0.3711*	0.3761*	0.469**	0.5408**	0.2934	0.1552	1	
GYP	-0.1643	0.2677	0.1214	0.5024**	0.4965**	0.3021	0.4551**	0.2938	0.1821	0.3405	1

**, ** indicates Significant and non-significant differences at 5% and 1% levels, respectively.*

Table 4: Genotypic direct and indirect effects of different characters on seed yield in maize

	DFT	DFS	DM	PH	EH	EL	EG	NKPE	NKPR	100-KW
DFT	**-0.2795**	-0.1426	0.1519	0.041	0.0449	-0.0084	0.0764	0.097	0.0858	-0.0539
DFS	0.4265	**0.8359**	-0.3515	-0.0179	-0.0501	0.3742	0.2874	0.203	0.0095	0.3987
DM	-0.0725	-0.0561	**0.1334**	0.0563	0.0541	-0.0335	-0.0174	-0.0793	0.0228	-0.0384
PH	0.4876	0.0713	-1.4051	**-3.3279**	-3.3203	-1.868	-1.3691	-1.5775	-1.1981	-1.2246
EH	-0.6361	-0.237	1.6034	3.9471	**3.9562**	2.1553	1.5953	1.8538	1.4312	1.4692
EL	-0.011	-0.1648	0.0925	-0.2066	-0.2006	**-0.3681**	-0.2136	-0.279	-0.1896	-0.1712
EG	-0.0487	0.0612	-0.0232	0.0732	0.0718	0.1033	**0.178**	0.1244	0.0751	0.0961
NKPE	-0.0322	0.0226	-0.0552	0.044	0.0435	0.0704	0.0649	**0.0929**	0.0362	0.0276
NKPR	0.0151	-0.0006	-0.0084	-0.0177	-0.0178	-0.0253	-0.0207	-0.0192	**-0.0491**	-0.0074
100-KW	-0.0249	-0.0615	0.0371	-0.0475	-0.0479	-0.06	-0.0696	-0.0384	-0.0195	**0.2975**
GYP	-0.1757	0.3283	0.1749	0.5441	0.5339	0.3399	0.5116	0.3778	0.2044	0.3671
Partial R^2	**0.0491**	**0.2745**	**0.0233**	**-1.8106**	**2.1121**	**-0.1251**	**0.0911**	**0.0351**	**-0.01**	**-0.0474**

Table 5: Phenotypic direct and indirect effects of different characters on seed yield in maize

	DFT	DFS	DM	PH	EH	EL	EG	NKPE	NKPR	100-KW
DFT	**-0.2149**	-0.0749	0.0205	0.0144	0.0145	-0.0231	0.0214	0.0202	0.0399	-0.0477
DFS	0.1318	**0.3779**	-0.1106	-0.0056	-0.016	0.1462	0.1096	0.0849	0.0129	0.1515
DM	0.0163	0.0502	**-0.1715**	-0.0698	-0.0687	0.0268	0.0047	0.0608	-0.0317	0.0337
PH	-0.0087	-0.0019	0.0533	**0.1308**	0.1302	0.0727	0.0537	0.0583	0.0458	0.0486
EH	-0.0367	-0.023	0.2178	0.5407	**0.5435**	0.2951	0.2195	0.2391	0.1934	0.2044
EL	-0.0242	-0.0871	0.0352	-0.1251	-0.1223	**-0.2251**	-0.129	-0.1582	-0.1131	-0.1056
EG	-0.0365	0.106	-0.0099	0.1501	0.1477	0.2095	**0.3657**	0.236	0.1483	0.1978
NKPE	0.0203	-0.0485	0.0767	-0.0963	-0.0951	-0.1519	-0.1395	**-0.2162**	-0.0758	-0.0634
NKPR	0.0049	-0.0009	-0.0048	-0.0092	-0.0093	-0.0131	-0.0106	-0.0092	**-0.0262**	-0.0041
100-KW	-0.0166	-0.0299	0.0147	-0.0277	-0.0281	-0.035	-0.0404	-0.0219	-0.0116	**-0.0746**
GYP	-0.1643	0.2677	0.1214	0.5024	0.4965	0.3021	0.4551	0.2938	0.1821	0.3405
Partial R^2	**0.0353**	**0.1012**	**-0.0208**	**0.0657**	**0.2699**	**-0.068**	**0.1665**	**-0.0635**	**-0.0048**	**-0.0254**

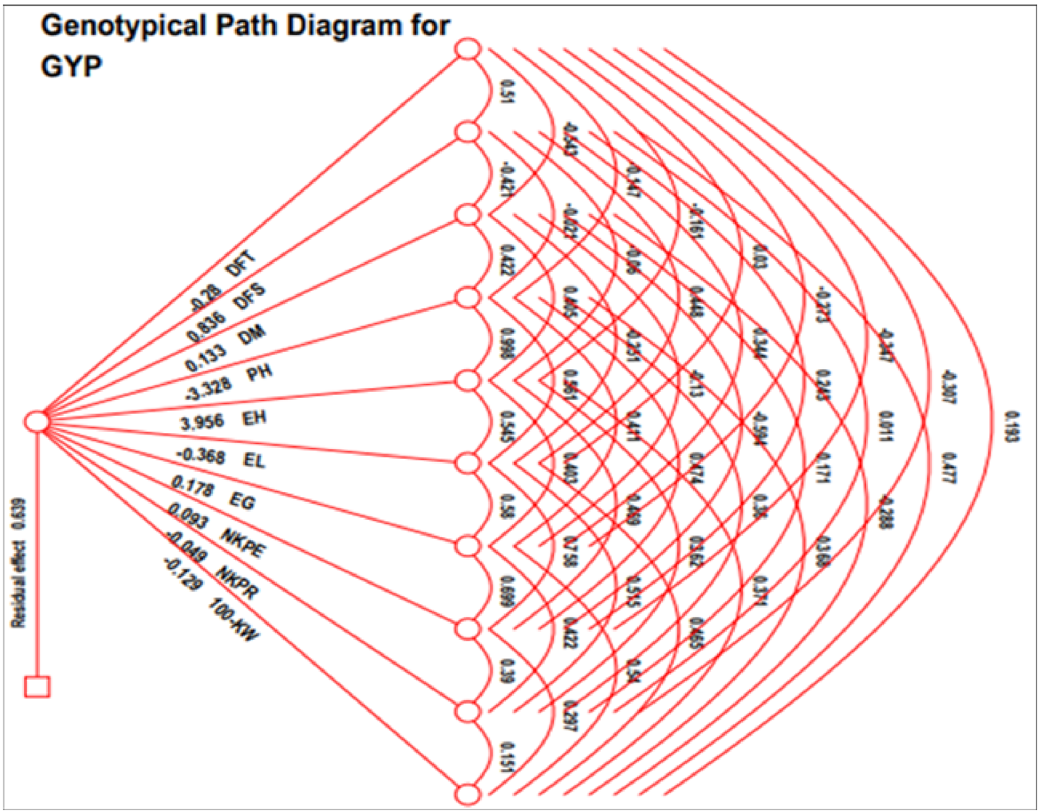

Fig. 1 : Genotypic path Diagram for seed yield per plant

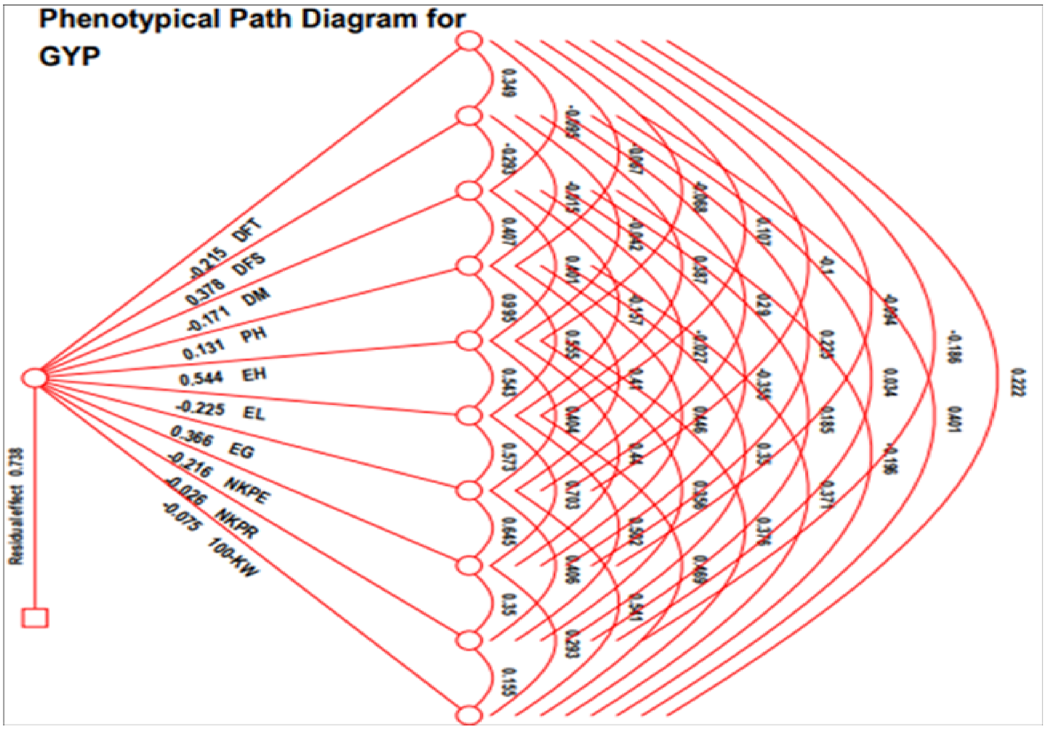

Fig. 2 : Phenotypic path Diagram for seed yield per plant

References

Ahmed, M.M., Asghar Mian, M., Afzal Choudhary. And Mohammand Anwar. (1978). Correlation study in maize. *Pakistan Journal of AgriculturalResearch,* **16,** 399-405.

Chinnadurai, I.S and Nagarajan, P. (2011). Interrelationship and path-coefficient studies for qualitative traits, grain yield and other yield attributes among maize. (*Zea mays* L.). *International Journal of Plant Breeding and Genetics,* **5**(2), 1-4.

Dewey, D.R. and Lu, K.A. (1959). Correlation and path - coefficient analysis of components of crested wheatgrass seed production 1. *Agronomy journal*, **51**(9), 515-518.

Firoza, K.S.M.R. (1999). Correlation coefficient and path analysis of some maize (*Zea mays* L.) hybrids. *Bangladesh Journal of Botany,* **28**(1), 9-15.

Fisher, R.A. & Yates, F. (1938). Statistical tables for biological, agricultural and medical research.

Grafius, A.E. (1959). Heterosis in barley. *Agronomy Journal,* **51,** 551-554.

Kumar, P.P and Satyanarayana, E. (2001). Variablity and correlation studies of full season inbred lines of maize (*Zea mays* L.). *Journal of Research ANGRAU,* **29**, 71-75.

Lenka, D. and Mishra, B. (1973). Path coefficient analysis of yield in rice varieties. *Indian J. Agric. Sci.,* **43**, 376-379.

Ministry of Agriculture. (2010). *Agriculture statistics at a glance,* Economics and Statistics, Government of India. 16.

Ministry of Agriculture. (2011-12). Government of India, (ON116). http://www.indiastat.com/table/ agriculture /2/maize/17199/7269/data.aspx

Mohan, Y.C., Singh, D.K and Rao, N.V. (2002). Path coefficient analysis for oil and grain yield in maize (*Zea mays* L.) genotypes. *National Journal of Plant Improvement,* **4**(1), 75-76.

Muhammad Akbar., Shakoor, M.S., Amerhussain and Muhmmad Sarwar. (2008). Evaluation of maize 3-way crosses through genetic variability, broad sense heritability, character association and path analysis. *Journal of Agricultural Research, Lahore,* **46**(1), 39-45.

Rao, N.J.M. (1986). Genetic analysis of yield and other quantitative traits of economic importance in maize (*Zea mays* L.). *Ph.D. Thesis,* Banaras Hindu University, Varanasi. pp.146.

Rao, V.B. (1993). Studies on the genetic architecture of Varun composite of maize (*Zea mays* L.). *M.Sc. (Ag) Thesis*, Andhra Pradesh Agricultural University, Hyderabad.

Shull, G.H. (1952). Beginnings of the heterosis concept. *Heterosis*, **23**, 31-33.

Sofi, P.A., Rather, A.G and Dar, Z. (2007). Association of heterotic expression for grain yield and its component traits in maize (*Zea mays* L.). *International Journal of Agricultural Research,* **2**(5), 500-503.

USDA. 2010. *World of corn*. 7-8.

Venugopal, M., Ansari, N.A and Rajanikanth, T. (2003). correlation and path analysis in maize. *Crop Research*, **25**(3), 525-529.

Wannows, A.A., Azzam, H.K and Al-Ahmad S.A. (2010). Genetic variances, heritability, correlation and path coefficient analysis in yellow maize crosses (*Zea mays* L.). *Agriculture and Biology Journal of North America,* **1**(4), 630- 637.

Wright, S. (1921). Correlation and causation. *Journal of Agricultural Research*, **20**, 557-585.

Wright, S. (1935). The analysis of variance and the correlations between relatives with respect to deviations from an optimum. *Journal of Genetics*, **30**(2), 243-256.