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SELECTION PARAMETERS THROUGH ASSESSMENT OF INTER-RELATIONSHIP AND PATH ANALYSIS BETWEEN YIELD AND YIELD COMPONENTS IN SUMMER MAIZE (*ZEA MAYS* L.)

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ABSTRACT

The aim of the study was to estimate correlation and path analysis, from which desirable characters could assist the plant breeder in ascertaining criteria to be used for the breeding programmes. Thirty three genotypes were evaluated at Field Experimentation Center, Department of Genetics and Plant Breeding, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences during *Zaid*, 2017. From the present work, grains per row (0.20*), 100 seed weight (0.91**) and cob length (0.39**) at genotypic level were found to be responsible for positive and strong association on grain yield. Path analysis also revealed largest direct effects through grains per row (0.10), 100 seed weight (0.85) and cob length (0.16) at genotypic level on grain yield and hence indirect selection for yield based on these characters would be appreciable.

INTRODUCTION

Maize (*Zea mays* L.) is a diploid (2n =20) cross pollinated crop. It is the third most important cereal crop after rice and wheat in the world's economy. Maize is known as *"Queen of Cereals"* because of its high production potential and wider adaptability. It can be grown in wide range of production environments, ranging from the temperate hill zones to the semi-arid desert margins. In India, maize is cultivated in an area of 9.2 m ha with an average productivity of 2.5 t/ha and production of 23.6 million tonnes (IIMR-Annual Report, 2016). Whereas, in Uttar Pradesh, maize is cultivated in an area of 0.9 m ha with an average productivity 1.70 t/ha and production of 1.10 million tonnes (IIMR-Annual Report, 2016). Maize offers tremendous scope for the plant breeders for genetic improvement. Hence, there is wide scope for further yield improvement and breaking the yield plateau in India through appropriate genetic manipulation, but the choice of selection of appropriate genotypes is of great concern. Selection for a character may lead to simultaneous improvement in associated characters from which understanding on interallelic relationship among different characters is essential to make any programme on improvement of character following appropriate method of plant breeding. (Diyali *et al.*, 2014). Grain yield is a complex quantitative character that depends on plant genetics and its interaction with environmental conditions (Khatab *et al.*, 2016). To determine such relationships, correlation analysis are used such that the values of two characters are analysed on paired basis, results of which may be either positive or negative (Akhtar *et al.*, 2015). Correlation coupled with path-coefficient analysis is a powerful tool to study the character associations and their final effect on yield. The correlations can only reveal the direction and magnitude of association between any two characters. However, to find out the direct and indirect effects of various components on yield, the correlations are partitioned into direct and indirect effects through path-coefficient analysis which was for the first time given by (Wright, 1921). Therefore, appropriate knowledge on interrelationship between grain yield and its contributing components and direct and indirect effects through path analysis will improve the efficiency of selection process towards grain yield through the use of appropriate selection indices. Therefore, the present paper deals with selection indices by assessing the correlation and path analysis in summer maize in order to identify potential parental lines and their subsequent use in maize breeding.

MATERIALS AND METHODS

The experimental material for the studied investigation consists of thirty three summer maize genotypes which were undertaken during *Zaid*, 2017 in Randomized Block Design with three replications of 60 x 20 cm spacing. Observations for all characters were recorded from five randomly selected competitive plants from each plot in each replication except for days to 50% tasseling and days to 50% silking where the observations were recorded on the plot basis. The correlation coefficient among the yield and yield components was estimated by formulae given by Al Jibouri *et al.* (1958). Path coefficient analysis was done according to Dewey and Lu (1959) for direct and indirect effects assessment on yield and its components.

RESULTS AND DISCUSSION

Correlation studies (Table 1) revealed that positive significant association was reported by grains per row (0.20*), cob length (0.39**), cob girth (0.32**) and 100 seed weight (0.91**) on grain yield at genotypic level. However, grains per row (0.19) showed non-significant positive association with grain yield at phenotypic level. . Based on the *inter se* performance among yield components, the characters like grains per row, cob length, cob girth and 100 seed weight showed positive and high significant association among themselves as well as with grain yield per plant. Overall view of the correlation studies showed that genotypic correlations in general are higher than phenotypic correlations indicating that the apparent associations are largely due to genetic reasons (Kote *et al.*, 2014). Similar results were reported by for positive association of grain yield by Ghimire and Timsina, 2015.

Path coefficient analysis (Table 2) revealed the direct positive effects through 100 seed weight (0.85), grains per row (0.10), cob length (0.16) on grain yield per plant at genotypic level. Similar results were recorded by several workers on different characters for direct positive effects on grain yield *viz.*, Meena *et al.*, 2016, Kumar *et al.*, 2017. Hence, direct selection based on these characters would be helpful for further improvement in grain yield. The highest positive indirect effects were detected by days to 50 percent silking, plant height, cob height via days to 50 percent tasseling; grain rows per cob, cob length via days to 50 percent silking; and grains per row, cob length, cob girth via 100 seed weight. Therefore, indirect selection for these characters might be effective for improving grain yield of

Table 1: Phenotypic (P) and Genotypic (G) correlation coefficients among yield and yield components in summer maize

Characters		Days to 50% tasseling	Days to 50% silking	Plant height	Cob height	Grain rows per cob	Grains per row	Cob length	Cob girth	100 Seed weight	Grain yield per plant
Days to 50 %	P	1.00	0.99**	0.16	0.14	-0.24*	-0.05	-0.20*	-0.06	-0.01	-0.09
tasseling	G	1.00	1.00**	0.16	0.14	-0.25*	-0.05	-0.21*	-0.06	-0.01	-0.09
Days to 50%	P		1.00	0.15	0.14	-0.22*	-0.05	-0.21*	-0.05	0.01	-0.07
silking	G		1.00	0.16	0.14	-0.24*	-0.05	-0.22*	-0.05	0.01	-0.07
Plant height	P			1.00	0.86**	0.36**	0.20*	0.44**	0.43**	0.48**	0.49**
	G			1.00	0.86**	0.38**	0.21*	0.44**	0.43**	0.49**	0.49**
Cob height	P				1.00	0.35**	0.26**	0.32**	0.42**	0.54**	0.55**
	G				1.00	0.37**	0.26**	0.32**	0.42**	0.54**	0.55**
Grain rows	P					1.00	0.45**	0.22*	0.53**	0.05	0.08
per cob	G					1.00	0.48**	0.23*	0.56**	0.06	0.08
Grains	P						1.00	0.26**	0.65**	0.32**	0.19
per row	G						1.00	0.26**	0.66**	0.32**	0.20*
Cob length	P							1.00	0.32**	0.38**	0.39**
	G							1.00	0.33**	0.38**	0.39**
Cob girth	P								1.00	0.41**	0.32**
	G								1.00	0.42**	0.32**
100 Seed	P									1.00	0.91**
weight	G									1.00	0.91**
Grain yield	P										1.00
per plant	G										1.00

Table 2: Phenotypic (P) and Genotypic(G) path coefficient analysis indicating direct and indirect effects on grain yield in summer maize

Characters		Days to 50% tasseling	Days to 50% silking	Plant height	Cob height	Grain rows per cob	Grains per row	Cob length	Cob girth	100 Seed weight	Correlation coefficient
Days to 50%	P	1.27	1.26	0.21	0.18	-0.31	-0.06	-0.26	-0.08	-0.01	-0.09
tasseling	G	4.28	4.28	0.72	0.62	-1.10	-0.21	-0.88	-0.27	-0.02	-0.09
Days to 50%	P	-1.43	-1.44	-0.23	-0.21	0.33	0.08	0.31	0.08	-0.004	-0.07
silking	G	-4.47	-4.47	-0.73	-0.66	1.11	0.23	1.00	0.23	-0.01	-0.07
Plant height	P	0.02	0.02	0.11	0.10	0.04	0.02	0.05	0.05	0.06	0.49**
	G	0.01	0.01	0.05	0.04	0.02	0.01	0.02	0.02	0.02	0.49**
Cob height	P	0.01	0.01	0.05	0.05	0.02	0.01	0.02	0.02	0.03	0.55**
	G	0.02	0.02	0.09	0.11	0.04	0.03	0.04	0.05	0.06	0.55**
Grain rows	P	-0.0003	-0.0002	0.0004	0.0004	0.001	0.0005	0.0002	0.001	0.0001	0.08
per cob	G	0.03	0.03	-0.04	-0.04	-0.11	-0.05	-0.03	-0.06	-0.01	0.08
Grains per row	P	0.001	0.001	-0.002	-0.002	-0.005	-0.01	-0.003	-0.01	-0.003	0.19
	G	-0.01	-0.01	0.02	0.03	0.05	0.10	0.03	0.07	0.03	0.20*
Cob length	P	-0.01	-0.01	0.02	0.01	0.01	0.01	0.05	0.01	0.02	0.39**
	G	-0.03	-0.04	0.07	0.05	0.04	0.04	0.16	0.05	0.06	0.39**
Cob girth	P	0.01	0.01	-0.05	-0.05	-0.06	-0.08	-0.04	-0.12	-0.05	0.32**
	G	0.01	0.01	-0.08	-0.08	-0.10	-0.12	-0.06	-0.19	-0.08	0.32**
100 Seed	P	-0.005	0.003	0.43	0.47	0.05	0.28	0.33	0.36	0.87	0.91**
weight	G	-0.005	0.002	0.42	0.46	0.05	0.27	0.32	0.36	0.85	0.91**

maize as mentioned by Jakhar *et al.,* 2017 and Pandey *et al.,* 2017. Considering direct effects, 100 seed weight, cob length and grains per row were the major yield contributing characters in maize. Therefore, emphasis should be made on these traits in the selection programme to evolve high yielding genotypes in summer maize.

CONCLUSIONS

Correlation and path coefficient analysis revealed that grains per row, 100 seed weight and cob length were found to be responsible for strong association and significant influence on grain yield as they have positively significant association and largest direct effects on yield. Hence, it is suggested that the breeding strategy would be indirect selection for yield, as these characters seems to be effective in further improvement in grain yield in summer maize.

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