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Research Note

Correlation study for Protein Content, Grain yield and Yield Contributing Traits in Quality Protein Maize (QPM) (*Zea mays* L.)

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Abstract:
Seventy Quality Protein Maize (QPM) (*Zea mays* L.) hybrids were grown in duplicate randomized complete block design for character association study to assess the relationship among total grain protein content, grain yield and its components. Total grain protein showed significant correlation with plant height and ear height. Character association analysis revealed strong positive association of Grain yield per plant with plant height, ear height, ear length, ear diameter, kernel rows per cob, kernels per row, test weight and shelling per cent. Total grain protein showed strong negative association with days to 50 % flowering, days to anthesis and days to 50% silking. Hence, simultaneous selection of plant height and ear height would contribute for the improvement of the grain yield per plant and total protein content in the grains at the same time.

Key words: Maize, correlation, grain Yield, protein, QPM

In India, maize ranks fifth in area, fourth in production and third in productivity *i.e.,* next only to rice and wheat. Grain yield and protein content in maize are complex characters and the result of interrelationships of their various components (Grafius, 1960). Thus, information on correlation coefficients among various plant traits helps to ascertain the degree to which these are associated with economic productivity. The association between two characters can directly be observed as phenotypic correlation. Correlations among and between pairs of agronomic traits provide scope for indirect selection in a crop breeding programme.. In this experiment we studied simple correlation between total grain protein, grain yield and yield components of maize.

In the present investigation, 70 hybrids derived from crossing fourteen QPM lines and five QPM testers in a line × tester mating design in Quality Protein Maize (QPM) (*Zea mays* L.) were studied. They were raised in a randomized complete block design with two replications at Zonal Agricultural Research Station, Mandya during *Rabi* 2009. In each replication, each entry was planted in a single row of 4.5 m length with a spacing of 75 cm between rows and 30 cm between plants. Observations on the traits listed in Table 1, were recorded. The mean of five plants was statistically analyzed for simple correlation utilizing the formula suggested by Aljibouri *et al*. (1985).

Simple correlation coefficients among total grain protein, grain yield and yield component characters in Quality protein maize (QPM) are presented in Table 1.

Correlation between total grain protein content and other traits: Total grain protein content had significant positive correlation with plant height (0.30) and ear height (0.29) while for all other traits the association was non-significant.. Hence, improvement in total grain protein of maize can be done by simultaneous selection of plant height and ear height. Earlier worker, Idikut *et al.* (2009) reported inverse relationship between protein and grain yield.

Correlation between grain yield and its components:
Plant height, ear height, ear length, ear diameter, 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 and days to 50 % brown husk maturity showed significant negative association with grain yield. The highest correlation with grain yield was recorded by ear length (0.82) followed by kernels per row (0.80), ear diameter (0.74), kernel rows per cob (0.63), shelling percentage (0.63), ear height (0.47), plant height (0.42) and test weight (0.39) which were positive and significant. Hence, improvement in grain yield of

maize can be done by simultaneous selection for these traits. Earlier Altinibas and Algan (1993) found significant correlation of days to silking and number of kernel rows with grain yield. They also added that grain yield per plant is positively correlated with and is significantly affected by 100- grain weight. El-saad *et al.* (1994) found highly significant correlation coefficients between grain yield per plant, days to 50% silking and plant height. Stojsin and Kannenberg (1994) studied five maize populations and found the highest correlation coefficients (0.95) between days to tasseling and silking and similar correlation was found between anthesis and plant height. Yousuf and Saleem (2001) opined that indirect selection for grain yield is possible through selection for number of kernel rows per ear and 100-grain weight. Jayakumar *et al*. (2007) reported significant and highest positive correlation of ear girth with grain yield followed by kernel rows, grains per row, grain weight, ear length, shelling percentage and crude protein and they also found plant height to be significantly and positively correlated with grain yield.

Inter correlation among different traits: Ear length was significantly and positively correlated with kernels per row, ear diameter, kernel rows per cob, ear height, plant height, test weight, and shelling percentage. Plant height was negatively but non significantly correlated with days to 50 per cent tasseling, days to anthesis and days to 50 per cent silking. The estimates of correlation coefficients of ear height with other traits were similar to plant height. Ear length had significant and positive correlation with all the traits except days to 50 per cent tasseling, days to anthesis, days to 50 per cent silking, days to 50 per cent brown husk maturity and protein content. Ear diameter, number of kernel rows per cob, number of kernels per row, test weight and shelling percentage showed similar trend as that of ear length. Similar results were reported in earlier findings of Yousuf and Saleem (2001), Jayakumar *et al*. (2007) and Yusuf (2010).

Based on the study, plant height and ear height were observed to be important selection indices for both total grain protein content and grain yield improvement. Hence, simultaneous improvement in both protein content and grain yield of maize can be achieved by indirect selection for these traits.

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Table: 1 Correlation coefficients between protein content, grain yield and its contributing characters in Quality Protein Maize (QPM) hybrids (*Zea mays* L.)

	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}
X_1	0.94**	0.90**	0.52**	-0.31**	-0.13	-0.07	-0.19*	-0.05	-0.13	-0.17*	-0.06	-0.19*	-0.15
X_2		0.96**	0.53**	-0.29**	-0.11	-0.05	-0.16*	-0.03	-0.13	-0.13	-0.10	-0.18*	-0.12
X_3			0.51**	-0.25**	-0.08	-0.05	-0.12	0.01	-0.11	-0.08	-0.09	-0.16*	-0.12
X_4				-0.01	0.11	0.05	0.05	0.05	0.01	-0.06	-0.08	-0.06	-0.03
X_5					0.82**	0.30**	0.58**	0.30**	0.33**	0.32**	0.15	0.42**	0.30**
X_6						0.37**	0.54**	0.33**	0.39**	0.26**	0.25**	0.47**	0.29**
X_7							0.72**	0.57**	0.86**	0.30**	0.29**	0.82**	-0.04
X_8								0.69**	0.71**	0.52**	0.24**	0.74**	0.11
X_9									0.65**	0.26**	0.19**	0.63**	0.06
X_{10}										0.33**	0.34**	0.80**	0.02
X_{11}											0.21**	0.39**	0.01
X_{12}												0.63**	-0.08
X_{13}													0.02

* Significant at 5 % level, ** Significant at 1 % level

X_1 Days to 50 % tasseling. X_2 Days to anthesis X_3 Days to 50 % silking X_4 Days to 50 % brown husk X_5 Plant height (cm)
X_6 Ear height (cm) X_7 Ear length (cm) X_8 Ear diameter (cm) X_9 Kernel rows per cob X_{10} Kernels per row
X_{11} Test weight (g) X_{12} Shelling percentage (%) X_{13} Grain yield per plant (g) X_{14} Protein content (%)