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Correlation Studies for Yield and Yield Contributing Characters in Sweetcorn (*Zea mays* L. *saccharata*)

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***Abstract* – The present investigation has been undertaken in sweet corn to carry out the correlation studies of yield and yield contributing characters. Eight divergent parents were selected and crossed in diallel fashion excluding reciprocals during *kharif,* 2010. The resulting 28 crosses along with parents were evaluated in Randomized Block Design replicated thrice, during rabi, 2010-11 at Agricultural Research Institute, Rajendranagar, Hyderabad. The data were collected on days to 50% tasseling, days to 50% silking, days to maturity, plant height, ear height, ear length, ear girth, number of kernel rows per ear, number of kernels per row, green fodder yield, green cob yield, 100 kernel (dry) weight and association of these characters to the seed yield (wet) per plant.. Phenotypic and genotypic correlations were worked out on yield and yield contributing characters in 28 crosses and 8 parents. In general, genotypic correlations were found to be higher than phenotypic correlations. Results revealed that there was a positive association of seed yield (wet) per plant with plant height, ear height, ear length, ear girth, number of kernel rows per cob, number of kernels per row, green cob yield, 100 seed (dry) weight and with green fodder yield**

***Keywords* – Diallel Analysis, Genotypic Correlation, Phenotypic Correlation, Seed Yield.**

I. INTRODUCTION

Grain yield is a complex character and is dependent on several contributing traits. Hence, character associations were studied in the present investigation, to assess the relationships among yield, its components for enhancing the usefulness of selection.

Genotypic correlations reveal the existence of real associations where as the phenotypic correlations may occur by chance. Significant phenotypic correlations without significant genotypic associations are of no value. If the genotypic correlation is significant and phenotypic is not, it means that the existing real association is masked by environmental effect. This indicates the importance of genotypic correlation compared to phenotypic correlation.

II. MATERIAL AND METHODS

The present investigation has been undertaken in sweet corn to carry out the correlation studies of yield and yield contributing characters. Eight divergent parents were selected and crossed in diallel fashion excluding reciprocals during *kharif,* 2010. The resulting 28 crosses along with parents were evaluated in Randomized Block Design replicated thrice, during rabi, 2010-11 at Agricultural Research Institute, Rajendranagar, Hyderabad. The data were collected on days to 50% tasseling, days to 50% silking, days to maturity, plant height, ear height, ear length, ear girth, number of kernel rows per ear, number of kernels per row, green fodder yield, green cob yield, 100 kernel (dry) weight and association of these characters to the seed yield (wet) per plant..

Simple correlation coefficients (r) for grain yield and its components of the hybrids and parents were calculated by using the method given by Johnson *et al.*[1] (1955):

$$r_g\,(xy) = \frac{Cov(xy)}{\sqrt{\text{var}(x).\text{var}(y)}}$$

$$Cov(xy) = \frac{1}{n}\left[xy - \frac{(xy)}{n} \right]$$

$$Var(x) = \frac{1}{n}\left[x^2 - \frac{(x^2)}{n} \right]$$

Where,
r(xy) = Correlation between x and y
Cov(xy) = Covariance for characters x and y
Var(x) = Variance for x
Var(y) = Variance for y
r = Correlation coefficient
xy = Two independent variables

III. RESULTS AND DISCUSSION

Days to 50 Per Cent Tasseling

Days to 50 per cent tasseling registered significant positive genotypic correlations with days to 50 per cent silking (1.022), days to maturity (0.810)and number of kernel rows per ear (0.158) and negative genotypic correlation with plant height (-0.692), ear height (-0.716), ear girth (-0.458), green cob yield (-0.441), 100 seed (dry) weight (-0.649), green fodder yield (-0.589), sugar content (-0.052) and seed yield (wet) per plant (-0.511).

Days to 50 Per Cent Silking

Significant positive genotypic correlations were recorded with days to maturity (0.817) and number of kernel rows per ear (0.184). But significant negative genotypic correlation was observed with plant height (-0.721), ear height (-0.749), ear length (-0.611), ear girth (-0.381), number of kernels per row (-0.583), green cob yield (-0.459), 100 seed (dry) weight (-0.718) green fodder yield (-0.541) and seed yield (wet) per plant (-0.537).

Earlier negative association of seed yield with days to 50 per cent silking was reported by Jenkins[2] (1929),

Umakanth and Sunil[3] (2000), Saleh *et al.*[4] (2002) and Hossain *et al.*[5] (2004).

Days to Maturity

Days to maturity showed significant negative genotypic correlations with plant height (-0.767), ear height (-0.744), ear length (-0.508), ear girth (-0.349), number of kernels per row (-0.615), green cob yield (-0.412), 100 seed (dry) weight (-0.603), green fodder yield (-0.498) and seed yield (wet) per plant (-0.497). But days to maturity did not show significant positive correlations at genotypic level with any trait.

In contrary, the findings of Mohan *et al.*[6] (2002) revealed that days to 50 per cent tasseling, days to 50 per cent silking, days to 50 per cent maturity, plant height, ear length, ear girth, kernel rows per cob, number of kernels per row and 100 grain weight have positive significant correlation with seed yield.

Plant Height

This character exhibited significant positive genotypic correlation with ear height (0.686), ear length (0.581), ear girth (0.708) number of kernel rows per cob (0.256), number of kernels per row (0.775), green cob yield (0.697), 100 seed dry weight (0.548), green fodder yield (0.736) and seed yield (wet) per plant (0.592). Negative significant genotypic correlation was observed with sugar content in kernel (-0.282). Similar results were reported earlier in maize for the association of grain yield with plant height by Zhao YuanZeng *et al.* [7](1999), Sujiprihati *et al.*[8] (2003) and Khazaei,[9] (2010).

Ear Height

Ear height exhibited significant positive genotypic correlations with ear length (0.441) ear girth (0.353), number of kernels per row (0.425), number of kernels per row (0.425), green cob yield (0.261), 100 seed dry weight (0.331), green fodder yield (0.483) and seed yield (wet) per plant (0.506). Negative significant genotypic correlation was observed with sugar content in kernel (-0.282). Similar results were reported earlier in maize for the association of seed yield with ear height by Singh *et al.* [10](2006).

Ear Length

Ear length exhibited significant positive genotypic correlations with ear girth (0.755), number of kernels per row (0.709), 100 seed dry weight (0.691), green cob yield (0.718), green fodder yield (0.765) and seed yield (wet) per plant (0.711). Similar results were reported earlier in maize for the association of grain yield with ear length by Choudhary and Chaudary[11] (2002), Singh *et al.*[10] (2006) and Khazaei[9] (2010).

Ear Girth

Ear girth recorded significant positive genotypic correlations with number of kernels per row (0.943), number of kernel rows per cob (0.618), green cob yield (0.993), 100 seed dry weight (0.775), green fodder yield (0.775) and seed yield (wet) per plant (0.803). Similar results were reported earlier in maize for the association of grain yield with ear girth by Singh *et al.*[10] (2006) and Jayakumar *et al.*[12] (2007).

Number of Kernel Rows perEar

Significant positive genotypic correlations were recorded with number of kernels per row (0.445), green cob yield (0.439), green fodder yield (0.530) and seed yield (wet) per plant (0.310). Significant negative genotypic correlation was observed with sugar content in the kernel (-0.187).

Number of Kernels per Row

At genotypic level positive significant correlations were recorded with green cob yield (0.859), green fodder yield (1.261), 100 seed (dry) weight (0.757) and seed yield (wet) per plant (0.682). Significant negative genotypic correlation was observed with sugar content in the kernel (-0.254).

Green Cob Yield

This character exhibited significant positive genotypic correlations with 100 seed dry weight (0.726), green fodder yield (0.927) and seed yield (wet) per plant (0.807). Whereas, significant negative genotypic correlation was observed with sugar content in the kernel (-0.230).

100 Seed Dry Weight

100 grain weight registered significant positive genotypic correlation with green fodder yield (0.901) and seed yield (wet) per plant (0.634). Significant negative genotypic correlation was observed with sugar content in the kernel (-0.189). Similar results were reported earlier in corn for the association of grain yield with 100 grain (dry) weight by Mohan *et al.*[6] (2002) and Tang Hua *et al.*[13] (2004).

Green Fodder Yield

Positive significant association was exhibited by this trait with seed yield (wet) per plant (0.987) at genotypic level.

Sugar Content

This character showed negative non-significant correlation with seed yield (wet) at genotypic level. Similar results were reported earlier in sweet corn for the association of grain yield with sugar content by Asbish Khanduri *et al.*[14] (2010) who found that kernel sugar concentration was not significantly correlated with any of the grain yield and its component traits suggesting the scope of genetic improvement of kernel sugar concentration independent of grain yield. In contrary, Kumari *et al.*[15] (2007) found positive correlation between Total Soluble Solids (TSS) and sugar content in the kernel.

IV. CONCLUSIONS

The study of genotypic character association among the yield components revealed positive association of seed yield (wet) per plant with plant height, ear height, ear length, ear girth, number of kernel rows per cob, number of kernels per row, green cob yield, 100 seed (dry) weight and with green fodder yield (Table 1) and positive association of plant height and ear girth with 100 grain (dry) weight. Further, the positive association of ear girth with 100 grain weight in addition to grain yield was reported by Panchanadhan *et al.*[16] (1978) and Zhao YuanZeng *et al.*[17] (1999).

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Table 1: Phenotypic (P) and Genotypic (G) correlation coefficient analysis of yield and yield contributing characters in sweetcorn

Character		Days to 50% 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	Green cob yield (kg ha^{-1})	100 seed (dry) weight(g)	Green fodder yield (kg ha^{-1})	Sugar content in percentage	Seed yield (wet) per cob (g)
Days to 50% tasseling	P	0.796**	0.684**	-0.466**	-0.432**	-0.393**	-0.289**	0.089	-0.183	-0.278**	-0.496**	-0.181	-0.018	-0.426**
	G	1.022**	0.810**	-0.692**	-0.716**	-0.604	-0.458**	0.158	-0.598**	-0.441**	-0.649**	-0.589**	-0.052**	-0.511**
Days to 50% silking	P	1	0.664**	-0.451**	-0.413**	-0.399**	-0.279**	0.155	-0.209*	-0.323**	-0.555**	-0.156	0.035	-0.389**
	G	1	0.817**	-0.721**	-0.749**	-0.611**	-0.381**	0.184*	-0.583**	-0.459**	-0.718**	-0.541**	0.048	-0.537**
Days to maturity	P		1	-0.589**	-0.506**	-0.310**	-0237*	0.044	-0.266**	-0.283**	-0.490**	-0.256**	0.077	-0.374**
	G		1	-0.767**	-0.744**	-0.508**	-0.349**	0.065	-0.615**	-0.412**	-0.603**	-0.498**	0.167	-0.497**
plant Height(cm)	P			1	0.690**	0.392**	0.487**	0.203*	0.421**	0.573**	0.441**	0.361**	-0.159	0.471**
	G			1	0.686**	0.581**	0.708**	0.256**	0.775**	0.697**	0.548**	0.736**	-0.282**	0.592**
Ear Height(cm)	P				1	0.287**	0.213*	0.007	0.265**	0.251**	0.254**	0.205*	-0.195*	0.424**
	G				1	0.441**	0.353**	0.010	0.425**	0.261**	0.331**	0.483**	-0.282**	0.506**
Ear Length(cm)	P					1	0.471**	0.175	0.331**	0.519**	0.541**	0.230*	-0.206*	0.516**
	G					1	0.755**	0.235	0.709**	0.718**	0.691**	0.765**	-0.189	0.711**
Ear Girth(cm)	P						1	0.438**	0.496**	0.697**	0.492**	0.446**	-0.047	0.504**
	G						1	0.618**	0.943**	0.933**	0.775**	0.775**	-0.095	0.803**

Tablel (cont.)

Character		Days to 50% 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 ear	Green cob yield (kg ha^{-1})	100 seed (dry) weight(g)	Green fodder yield (kg ha^{-1})	Sugar content in percentage	Seed yield (wet) per cob (g)
Number of kernel rows per cob	P							1	0.185*	0.300**	0.058	0.172	-0.129	0.226*
	G							1	0.455**	0.439**	0.077	0.530**	-0.187*	0.310**
Number of kernels per row	P								1	0.573**	0.348**	0.291**	-0.134	0.412**
	G								1	0.859**	0.757**	1.261**	-0.254*	0.682**
Green cob yield (kg ha^{-1})	P									1	0.532**	0.420**	-0.192*	0.598**
	G									1	0.726**	0.927**	-0.230*	0.807**
100 seed (dry)weight (g)	P										1	0.310**	-0.122	0.496**
	G										1	0.901**	-0.189*	0.634**
Green Fodder yield (kg ha^{-1})	P											1	-0.034	0.396**
	G											1	-0.106	0.987**
Sugar content in percentage	P												1	-0.177
	G												1	-0.155

P represents Phenotypic correlation coefficient; **G** represents Genotypic correlation coefficient.
*Significant at 5 per cent level; ** Significant at 1 per cent level