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Genetic analysis for maturity and height traits in maize (*Zea mays* L.)

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SUMMARY

Combining ability was estimated for maturity and height for different five traits in maize using 8 x 8 half diallel crosses. General and specific combining ability variances were highly significant for all the traits. Both additive and non-additive gene actions played an important role for the inheritance of all the components. Inbreds GWL-3 and GWL-8 were observed to be superior having significant negative gca effects for all the characters. The cross CML-264 x GWL-2 possessed good sca effects in desirable direction for days to 50 % tasselling, silking, ear height and days to 75 % dry husk.

Key words : Diallel, Combining ability, *Zea mays* L.

Combining ability is one of the most effective tool for deciding the appropriate parents for new crossing programmes. It is also effective in choosing the appropriate breeding approach for handling a crop to develop new variety. Maturity plays an important role in the acceptance of a maize variety by the farmers under the wide range of cropping systems whereas, application of fertilizers, particularly chemical ones, and ultimately grain yield are strongly associated with plant height trait. In the present study, general and specific combining ability analysis and estimates of gene actions were find out for eight inbreds of maize and their 28 F_1's.

MATERIALS AND METHODS

Eight white kernel maize inbreds *viz*., CML-260, CML-264, GWL-2, GWL-3, GWL-8, GWL-12, GWL-14 and GWL-17 alongwith their 28 F_1's, were grown at Agronomy Farm, Anand Agricultural University, Anand during *Rabi* 2006-07. The experimental materials were grown in randomized block design with three replications in two rows of 5 m. length having inter and intra row spacing of 60 cm and 20 cm., respectively. Five plants from each plot were randomly selected for recording the different observations of plant and ear height. Observations on days to 50% tasseling, silking and days to 75% dry husk were recorded on plot basis. Combining ability analysis was carried out according to Model- I, Method- II proposed by Griffing (1956).

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RESULTS AND DISCUSSION

Analysis of variance revealed that presence of significant amount of variability among the parents and crosses for all the traits.

The analysis of variance for combining ability observed highly significant for gca and sca for all the characters under study (Table 1) suggesting thereby, importance of both additive and non-additive gene actions for the inheritance of these characters as reported by Nagda *et al*. (1994), Nagesh Kumar *et al*. (1999) and Mahto and Ganguli (2003). However, the component of variation (M.S.S) due to gca was higher than that due to sca, indicating the preponderance of additive gene actions for all the attributes. It infers that the experimental materials may be more efficiently exploited by adopting any population improvement method for composite development. These findings are in close agreement with those of Singh (1991) and Vasal *et al*. (1993) for days to silking, plant height and ear height.

Estimates of gca effects (Table 2) indicated that parents CML-264 and GWL-12 recorded high negative gca effects for majority of the traits; whereas, parent GWL-14 had high significant negative gca effects only for days to 50% tasseling and days to 75% dry husk. The parents GWL-3 and GWL-8 were observed to be superior, having significant negative gca effects for all the characters. These finding suggest that these two parents GWL-3 and GWL-8 may be utilized in hybridization programmes for improving maize genotypes with respect to earliness and dwarfness.

Estimates of sca effects (Table 3) showed that cross CML-264 x GWL-2 had significant negative sca effects for days to 50% tasselling, silking, ear height and days to 75% dry husk. The crosses CML-260 x GWL-2 and

Table 1: ANOVA for combining ability for maturity and height traits in maize

Source	d.f.	Days to 50 % tasselling	Days to 50 % silking	Plant height	Ear height	Days to 75 % dry husk
gca	7	31.90**	18.24**	712.49**	350.71**	19.75**
sca	28	3.81**	4.17**	336.67**	114.33**	4.94**
Error	70	0.44	0.39	15.13	4.87	0.77

* and ** indicate significant of values at P=0.05 and 0.0, respectively

Table 2 : General combining ability (*gca*) effects for various characters in maize

Parents	Days to 50 % tasselling	Days to 50 % silking	Plant height	Ear height	Days to 75 % dry husk
CML-260	0.03	0.03	14.94**	11.49**	-0.02
CML-264	-0.24	-0.43*	-11.34**	-5.00**	-0.48
GWL-2	4.26**	3.23**	4.54**	0.96	3.22**
GWL-3	-0.41*	-0.37*	-8.32**	-5.19**	-0.72**
GWL-8	-1.38**	-1.07**	-5.91**	-3.86**	-0.68**
GWL-12	-0.71**	-0.83**	-0.46	-4.32**	-1.05**
GWL-14	-1.21**	-0.27	2.70*	5.15**	-0.88**
GWL-17	-0.34	-0.30	3.84**	0.78	0.62*
S. E. (g_i) $\pm$	0.20	0.18	1.15	0.65	0.26

* and ** indicate significantly of values at P=0.05 and 0.01, respectively.

Table 3: Estimates of sca effects of ten promising hybrids in maize

Hybrids / crosses	Days to 50 % tasselling	Days to 50 % silking	Plant height	Ear height	Days to 75 % dry husk
CML-260 x GWL-2	-2.29**	-2.23**	5.87	5.16**	-5.03**
CML-260 x GWL-3	-1.96**	-1.96**	8.46*	1.98	-2.43**
CML-260 x GWL-8	1.01	2.07**	5.72	-10.28**	0.53
CML-260 x GWL-17	0.31	1.64**	-14.37**	-0.39	2.90**
CML-264 x GWL-2	-3.69**	-4.76**	0.75	-5.15*	-1.57*
CML-264 x GWL-3	-1.69**	-2.16**	-1.33	-2.47	0.37
CML-264 x GWL-14	-0.56	-0.26	-8.55*	1.99	0.53
GWL-2 x GWL-12	-2.56**	-2.03**	15.93**	9.64**	2.67**
GWL-3 x GWL-12	-1.89**	-2.43**	7.32*	8.18**	-0.07
GWL-12 x GWL-14	0.57	1.14*	-1.17	-11.36**	1.10
S. E. (S_{ij}) $\pm$	0.61	0.56	3.52	2.00	0.79

* and ** indicate Significant of values at P=0.05 and 0.01, respectively

CML-260 x GWL-3 showed high negative estimate for the days to 50% tasselling, silking and days to 75% dry husk; whereas, crosses CML-264 x GWL-3, GWL-2 x GWL-12 and GWL-3 x GWL-12 recorded high negative sca effects for days to 50% tasselling and silking. Crosses CML-260 x GWL-17 and CML-264 x GWL-14 observed significant negative sca effects for plant height; whereas crosses CML-260 x GWL-8 and GWL-12 x GWL-14 were high negative sca effects for ear height. It suggests that these crosses may be exploited for developing early and dwarf maize genotypes in breeding programmes. However, contradictory to the present results, equal importance of both gca and sca components of variance was reported by Landi *et al*. (1986) for days to tasselling and plant and ear heights. Preponderance of sca component of variance was also observed for days to silking and plant and ear heights (Nawar and El-Hossary, 1984).

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