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COMBINING ABILITY IN FODDER PEARL MILLET

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ABSTRACT

Combining ability analysis was done in pearl millet for 12 quantitative traits including crude protein, calcium and oxalate contents. Predominance of GCA variance was observed in the traits *viz.*, days to 50 per cent flowering, internodal length, green fodder yield per clump, dry matter yield per clump, crude protein and oxalate contents while other six quantitative traits *viz.*, plant height, number of tillers per clump, number of leaves per clump, leaf area per clump, stem girth and calcium content showed predominance of SCA variance.

KEY WORDS : Combining Ability, Fodder Pearl Millet

Yield is a complex character involving complex gene action. The knowledge of combining ability analysis has been utilised to know the gene action regarding yield attributing characters in fodder pearl millet. In order to develop a suitable hybrid, a study was made involving six genotypes of fodder pearl millet crossed in a diallel fashion.

MATERIALS AND METHODS

Six genotypes of *Pennisetum americanum* (L.) Leeke differing in quantitative traits *viz.*, IP 5908, IP 9354, IP 9825, IP 10103, IP 3555 and IP 3489 were crossed in all possible combinations in diallel I mating design. In summer 1994 (February) a trial comprising of 30 hybrids with 6 parents was laid out in a randomised block design with three replications at the Agricultural College and Research Institute, Killikulam. The F_1s were grown in a single row of 5 m length with a spacing of 45 and 50 cm within and between rows respectively. Leaving the border plants, data was recorded on randomly selected five plants in each of the F_1s for single plant observation. The combining ability analysis was done following method I and model I of Griffing (1956).

RESULTS AND DISCUSSION

The analysis of variance for combining ability revealed that significant difference among parents for all the traits indicating an appreciable amount of differences in the genetic contribution of the parents and genetic interaction in hybrids.

General Combining ability effects

The high *gca* effects for a particular trait of a parent indicates the additive gene effect for the trait. It could be expected that if the parents possessing high *gca* effects were combined by hybridisation, a large proportion of progenies would have value for the trait concerned facilitating

Table 1. General combining ability effects of parents

Parent	Days to 50 per cent flowering	Plant height	Number of tillers per plant	Number of leaves per clump	Leaf area per clump	Inter nodal length	Stem girth	Green fodder yield per clump	Dry matter yield per clump	Crude protein content	Calcium content	Oxalate content
IP 5908	-1.10**	-1.71**	-0.00	-0.19	-0.06**	-1.29**	-0.02	32.98**	7.09**	0.23**	-0.03**	-0.22**
IP 9825	-0.30**	0.88**	-0.10	-5.33**	-0.08**	-0.76**	0.03	17.51**	4.45**	-0.73**	-0.00	-0.13**
IP 9354	2.56**	2.02**	-0.23**	4.44**	0.11**	1.05**	0.07**	2.49**	-1.58**	0.27**	0.08**	0.13**
IP 10103	-2.35**	-4.83**	-.26**	-0.07	-0.06**	-0.35**	0.01	-42.76**	-7.41**	-0.57**	-0.00	0.09**
IP 3555	2.26**	6.77**	0.35**	0.33	0.09**	0.52**	-0.01	16.14**	2.56**	1.39**	-0.06**	0.12**
IP 3489	-1.07**	-3.12**	-0.28**	0.82**	0.00	0.83**	-0.08**	-21.38**	-5.11**	-0.54**	0.01**	0.04**
SE (g)	0.10	0.29	0.07	0.27	0.005	0.04	0.01	0.91	0.06	0.006	0.003	0.003

* Significant at 5 per cent level; ** Significant at 1 per cent level

Table 2. Specific combining ability effects of direct crosses

Crosses	Days to 50 per cent flowering	Plant height	Number of tillers per plant	Number of leaves per clump	Leaf area per clump	Inter nodal length	Stem girth	Green fodder yield per clump	Dry matter yield per clump	Crude protein content	Calcium content	Oxalate content
P_1xP_2	-4.18**	-3.03**	1.34**	17.38**	-0.09**	-3.40**	0.00	-35.75**	-3.88**	0.45**	-0.02**	0.27**
P_1xP_3	2.13**	-2.41**	-0.63**	1.54*	-0.07**	0.83**	0.03	9.83**	-1.08**	-0.16**	-0.04**	0.44**
P_1xP_4	-3.29**	9.57**	-0.68**	-0.71	0.15**	-0.98**	-0.04	26.49**	6.46**	0.28**	0.06**	-0.24**
P_1xP_5	0.94**	2.65**	0.96**	16.12**	0.58**	1.53**	-0.18**	37.90**	2.69**	0.14**	0.02**	-0.18**
P_1xP_6	4.10**	-8.04**	-0.38*	-6.74**	-0.20**	1.59**	0.28**	26.11**	3.75**	0.10**	-0.01	-0.28**
P_2xP_3	0.16	8.60**	-0.66**	-6.68**	-0.03	1.53**	-0.19**	39.36**	7.42**	0.43**	0.06**	-0.14**
P_2xP_4	-0.93**	-0.15	-0.39*	5.43**	-0.01	2.14**	0.06	-52.17**	-9.68**	1.25**	0.18**	-0.11**
P_2xP_5	2.46**	12.09**	0.79**	1.47*	0.22**	-0.50**	0.21**	28.33*	2.72**	-0.80**	0.09**	-0.10**
P_2xP_6	-3.20**	-9.48**	-0.05**	-2.56**	-0.10**	-3.74**	-0.26**	60.94**	8.09**	-0.32**	-0.01	-0.06**
P_3xP_4	6.05**	4.00**	0.18	-3.24**	0.24**	1.02**	0.27**	3.60	1.52**	-0.60**	0.01	0.19**
P_3xP_5	-2.90**	-15.44**	-0.18	-3.58**	-0.23**	-2.09**	-0.01	-10.23**	-1.28**	0.10**	0.11**	0.13**
P_3xP_6	-4.06**	7.65**	0.79**	27.83**	0.64**	-0.35**	0.17**	-30.25**	-4.18**	0.55**	0.10**	0.08**
P_4xP_5	-1.98**	-20.66**	1.14**	3.74**	-0.17**	-2.42**	-0.06	14.97**	2.72**	0.91**	-0.03**	0.26**
P_4xP_6	0.35	9.11**	1.70**	5.14**	0.05**	0.12	0.15**	5.68**	0.45**	-0.51**	0.00	0.53**
P_5xP_6	0.24	-6.38**	-0.13	0.86	0.11**	2.09**	0.05	-24.81**	-4.55**	0.84**	0.06**	0.48**
S.E (Sij)	0.23	0.67	0.16	0.62	0.01	0.10	0.03	2.07	0.15	0.01	0.008	0.008

* Significant at 5 per cent level; ** Significant at 1 per cent level.
P_1 : IP 5908; P_2 : IP 9825; P_3 : IP 9354 P_4 : IP 10103; P_5 : IP 3555 P_6 : IP 3489

easy selection for the trait. According to Simmonds (1979), the *gca* effects is considered as inherent genetic value of the parent for a trait which is due to additive gene effect and it is fixable. The parents IP 3555 and IP 9354 were found to be the best combiners followed by IP 5908 and IP 9825. There was no correspondance between *per se* performance and *gca* effects of the parents. Thus selection of parents for their good general combining ability cannot be based on their *per se* performance (Table 1).

Specific combining ability effects

The good specific cross combinations were IP 3555 x IP 9825 for days to 50 per cent flowering; IP 9825 x IP 3555 for plant height; IP 3489 x IP 9354 for number of tillers per clump; IP 9354 x IP 3489 for number of leaves per clump and leaf area per clump; IP 9825 x IP 10103 for internodal length, crude protein and calcium contents; IP 9825 x IP 3555 for stem girth; IP 9825 x IP 3489 for green fodder and dry fodder yield; and IP 5908 x IP 3489 for oxalate content showed the highest *sca* effect for the respective traits. The best F_1 is not from the crosses which showed maximum *gca* effects. The discrepancy may be explained by the fact that the comparison of these two estimates is a comparison of an absolute value with a relative value. The obsolute values (performance of F_1) being similar, the relative values (*sca* effect) would increase with decrease in the performance of base population. The crosses showing significant *sca* effects involved one good and other poor combiners or even both poor general combiners in this study (Table 2). Thus, the choice of the parents should be based on their general combining ability test. The crosses exhibiting high *sca* effect involving one good and one poor general combiners could also produce desirable transgressive segregants.

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