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COMBINING ABILITY FOR YIELD IN MAIZE

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ABSTRACT

Genetics of seed weight and grain yield in maize was studied through diallel analysis in two different situations, viz., winter and summer seasons. Combining ability revealed that both additive and nonadditive genetic variances were important in the expression of seed weight and yield in both seasons. K-725 and K- 729 were the most desirable donors of seed weight and grain yield. The crosses K-729 x K-644 (S) and K-720 x K-644 (W) produced bold seeded hybrids. K-725 x K-644 (S) and K-725 x K-622 (W) were the highest yielding hybrids in summer and winter season, respectively. Due to dissimilarity in seasons, development of season specific hybrids/varieties has been suggested.

Key words: Combining ability, diallel, maize.

Bold seed is an important component of higher yield in maize. In most of the previous studies, it has been reported that seed weight is predominantly governed by additive gene effects. Therefore, it is the most fixable trait in many crops including maize. In winter season, higher seed weight is one of the major contributing yield component. Considering its importance, the bold seeded parental lines should be identified and exploited in the breeding programme for developing high yielding hybrids/composite cultivars in maize crops.

RESULTS AND DISCUSSION

The general and specific combining ability variances were significant for seed weight and grain yield in summer and winter seasons. This suggests that both additive and nonadditive genetic components play an important role in bringing out heterotic effects in these characters. However, higher magnitude of gca variances in both the seasons indicated the predominance of additive and additive x additive epistatic components, which are fixable. Similar observations were reported by Prasad et al. [2] in maize for different characters including seed weight.

Examination of gca effects (Table 1) revealed that K-729 and K- 725 were the best general combiners for grain yield and 100-seed weight in both the seasons. K-613 and K-720 were the other desirable parents for grain yield in summer as well as winter season.

Studies on sca effects indicated that most of the superior crosses were between parents with high x low, high x and high x medium combining parents suggesting that the involvement of one good general combiner appears to be essential to get the better specific combination. Ranking on the basis of per se performance of the hybrids was not similar to their sca effects. Such reports were published earlier [3]. For understanding these results better, the five top crosses on the basis of per se performance and sca effects were selected and compared (Table 2). The best specific cross combinations with respect to sca effects and per se performance were different in summer as well as winter season for grain yield and 100-seed weight. This means that season-specific hybrids/varieties have to be developed because of dissimilarities in the weather conditions.

Table 1. General combining ability effects for 100-seed weight and yield in maize over two seasons

Parent	100-seed weight		Grain yield	
	summer	winter	summer	winter
K-729	7.82*	9.75*	2.05*	1.89*
K-725	4.38*	5.25*	2.04*	2.33*
K-613	1.28	0.90	2.26*	1.191*
K-720	4.80*	4.40*	2.46*	0.65
K-644	-7.80*	-4.25*	-1.97*	-1.82*
K-707	-9.68*	-8.69*	-3.95*	-2.79*
K-708	2.48	0.50	-2.21*	0.85
K-621	3.12	0.33	0.86	0.98
K-622	0.60	1.46	0.34	-0.84
K-608	-7.00*	-9.65*	-0.88	-3.16*
S.E. (g.i.)	1.69	2.06	0.75	0.94

*Significant at 5% level.

Table 2. Crosses selected on the basis of per se performance and sca effects in F_1 of two seasons in maize

Summer		Winter	
per se performance	sca effects	per se performance	sca effects
100-seed weight			
K-729 x K-644 (H x L)	K-613 x K-720 (A x H)	K-720 x K-644 (H x L)	K-725 x K-720 (H x L)
K-725 x K-644 (H x L)	K-725 x K-708 (H x A)	K-729 x K-725 (H x H)	K-725 x K-622 (H x A)
K-720 x K-707 (H x L)	K-720 x K-608 (H x L)	K-729 x K-720 (H x H)	K-720 x K-708 (H x A)
K-729 x K-725 (H x H)	K-729 x K-613 (H x A)	K-729 x K-613 (H x A)	K-729 x K-729 (H x H)
K-729 x K-708 (H x A)	K-720 x K-622 (H x A)	K-725 x K-62 (H x A)	K-729 x K-725 (H x H)
Grain yield			
K-725 x K-644 (H x L)	K-729 x K-613 (H x H)	K-725 x K-622 (H x A)	K-725 x K-708 (H x A)
K-720 x K-644 (H x L)	K-613 x K-644 (H x L)	K-729 x K-720 (H x A)	K-729 x K-622 (H x A)
K-729 x K-725 (H x H)	K-725 x K-621 (H x A)	K-725 x K-608 (H x L)	K-725 x K-613 (H x H)
K-707 x K-621 (L x A)	K-725 x K-720 (H x H)	K-613 x K-720 (H x A)	K-729 x K-644 (H x L)
K-720 x K-608 (H x A)	K-729 x K-644 (H x L)	K-613 x K-621 (H x A)	K-720 x K-622 (A x A)

Note: Combining ability: H—high, L—low and A—average.

The cross K-725 x K-644 in summer and K- 725 x K-622 in winter produced the top yielding hybrids, the crosses with highest sca values were recorded in K- 729 x K-613 in summer and K-725 x K-708 in winter. Similar trend was observed for 100-seed weight in both the seasons.

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