Madras Agric. J. 80 (9) : 500 - 502 September 1993

https://doi.org/10.29321/MAJ.10.A01690

LINE X TESTER ANALYSIS FOR HEAVY SEEDS IN CHICKPEA

P.GOMATHINAYAGAM, P.NAGARAJAN, K.K.VINOD and R.RATHNASWAMY

ABSTRACT

To know the combining ability of seed weight in chickpea, five lines namely Co_1, Co_2, CoG_4, CoG_6 and $ICCV_2$ as females and three testers namely Annigeri, Co_3 and L 550 as males were crossed in a line x tester model. The effects of the parents and the sca effects of the hybrids were estimated. The estimates of gca revealed that significant and positive effects were observed with CoG_4 (5.241), CoG_6 (1.627) and $ICCV_2$ (1.775) among lines and with Annigeri (1.468) among testers. The hybrids CoG_4 x Annigeri showed high sca effects (2.982), while CoG_6 x Co_3 (4.028) and $ICCV_2$ x Co_3 showed high sca (1.524) with high per se performance. The gca and sca variance ratio showed the preponderance of non-additive gene action for the seed weight in chickpea (0.1734:1).

Key Words : *Combining Ability, Non-additive Gene Action, Genotypes.*

INTRODUCTION

The combining ability analysis of parental lines in hybrid combinations is a common biometrical approach, in isolating good combiners, so that they could be utilized for different breeding programmes. Among the different methods available, line x tester analysis is a commonly used one. The present study was conducted using 5 lines and 3 testers, producing 15 hybrids combinations. The performance of parents and hybrids were recorded for heavier seeds and their gca effects and sca effects of hybrids were estimated as per Kempthorne (1957).

RESULTS AND DISCUSSION

The analysis of variance revealed highly significant differences among genotypes for the weight of the seeds, which indicated that they could be utilized for further analysis. Among the lines hundred seed weight ranged between 11.76 g (Co_2) to 31.47 g (Co_3) (Table 1). The parents viz. CoG_6, ICCV 2, Co_3 and L 550 have recorded significantly higher seed weight over grand mean. The estimates on gca (Table - 1) revealed significant positive values with CoG_4, CoG_6, and ICCV 2 among lines and Annigeri among testers. The higher gca is due to the additive gene action for the inheritance of particular character. Thus hybridisation and selection will be very effective using these parents in segregating populations (Rojas and Sprague, 1952). Nevertheless, the use of parents like CoG_4, CoG_6, ICCV 2 will be very effective because they pose

Department of Pulses, School of Genetics, Tamil Nadu Agricultural University, Coimbatore - 641 003

Table 1. Per se performance of lines, testers and hybrids for seed size (100 grain wt. in gms).

Lines	Tester			Mean of lines
	T_1	T_2	T_3	
	(Annigeri)	(Co3)	(L 550)	
	(Mean of hybrids)			
L1 (Co1)	19.17	15.40	18.50	12.89
L2 (Co2)	17.03	13.77	15.33	11.76
L3 (CoG_4)	30.55**	20.85	26.90**	21.46
L4 (CoG_6)	20.24	25.31**	21.90**	31.68**
L5 (ICCV2)	24.64**	22.96**	20.30	26.20**
Mean of testers	18.89	31.47**	26.45**	

GM = 21.460; SE = 0.1130; CD (0.05) = 0.3219; CD (.01) = 0.430

** Significant at 0.01%

Table 2. Combining ability effects of lines, testers and hybrids for seed size (100 grain wt. in gms)

Lines	Testers			gca of lines
	T_1	T_2	T_3	
	(Annigeri)	(Co 3)	(L 550),	
	(Sca of hybrids)			
L1 (Co 1)	0.014	-1.093**	1.079**	-3.165**
L2 (Co 2)	0.181	-0.406**	0.226	-5.478**
L3 (CoG 4)	2.982**	-4.052**	1.070**	5.241**
L4 (CoG 6)	-3.715**	4.028**	-0.313	1.627**
L5 (ICCV 2)	0.538*	1.524**	-2.061	1.775**
gca of testers	1.468**	-1.198**	-0.270*,	

*Significant at 0.05% ** Significant at 0.01%

	Lines	Testers	Hybrids
SE	0.065	0.051	0.113
CD (0.05)	0.185	0.144	0.322

for the better selection index than other by coupling both the gca effects and high per se performance.

Analysis on hybrid performance revealed higher sca performance for hybrids (Table 2), those involved either or one of those parents which showed higher gca effects. In such cases it is possible to isolate high yielding segregant from early generations (Ragavaiah & Joshi, 1986). The l[illegible] Annigeri showed hi[illegible] effects and [illegible] he parents [illegible] got higher [illegible]

combination will show high heterosis and will give wide chances of utilising it for both heterosis and pedigree breeding. This combination shows high additive effects and it is early fixable, through pedigree way. However, CoG 6/Co 3 and ICCV 2/Co 3 showed high sca with high per se performance. These hybrids are the products of high gca and low gca parents, hence, may throw more transgressive segregant (Derrah and Hallauer, 1972). This effect may be due to the differential interaction between dominant alleles of the high gca parent and recessive alleles from low gca parents (Dubey, 1975).

In chickpea, both additive and non-additive components were significant for seed weight. (Salimath and Bahl, 1989). Similar trends were observed on studying the cumulative gene effects in chickpea (Gupta and Ramanujam, 1974). These observations suggest that a breeding method that can exploit both additive and non additive genetic effects would be useful in chickpea breeding (Gowda & Bahl, 1978).

In other crosses, the inconsistent relationship between gca and sca might be due to complex genetic interactions (Hayman, 1958). However, the gca and sca variance ratio analysis shows preponderance of non-additive gene action for the weight of the seeds in chickpea (0.1734:1). However, higher additive action in specific combinations could not be ruled out.

REFERENCES

DERRAH,L.L. and HALLAUER.A.R., 1972. Genetic effects of estimates from generation mean in 4-diallel set of maize inbreds. **Crop Sci. 12**: 615-621.

DUBEY.R.S. 1975. Combining ability in cigar filler tobacco. **Indian J.Genet.**, 35: 76-82.

GOWDA, C.L.L. and BAHL, P.N., 1978. Combining ability in chickpea.**Indian J.Genet.**, 38: 245-251.

GUPTA,V.P. and RAMANUJAM.S., 1974. Cumulative gene effects and genetic parameters of heterosis in F1 and F2 generations of chickpea. **Genetika** 6: 263-275.

HAYMAN,B.I., 1958. The separation of epistatic from additive and dominance variation in generation means. **Heredity, 12**: 371-390.

KEMPTHORNE,O., 1957. "An introduction to genetic statistics". John Wiley and sons. Inc.

RAGAVAIAH,P., and JOSHI, M.G., 1986. Combining ability studies in emmer Wheat. **Indian J. Genet.**46 (3): 476-483.

ROJAS and SPRAGUE, 1952. A comparison of variance components in corn yield trials: III. General and specific combining ability and their interaction with locations and year. **Agron.J.44**: 462-466.

SALIMATH, P.M. and BAHL, P.N., 1989. Combining ability studies in crosses involving tall and dwarf types in chickpea (**Cicer arietinum** L.) **Indian J. Genet.** 49(1): 29-34.