



## Combining Ability Analysis of Yield Traits in Greengram Under Late Rice Fallows

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### ABSTRACT

A line X tester in greengram under late fallows situation indicated for both *gca* and *sca* were equally important for most of the traits under considerations including yield per plant. Among the lines Pusa-9672 and among the testers LGG – 407 were good general combiners for yield per plant in addition to other yield contributing traits. Among the cross combinations LGG – 460x LGG- 407, MGG-341x LGG-407, Pusa-9672xWGG-2, Pusa-9672 X TARM-21, Pusa-9672xLGG-440 and LocalxLGG-440 showed good specific combining ability for most of the traits in desired direction, combined with high mean values for seed yield per plant. These cross combinations should be suggested in breeding programmes involving cyclic hybridization to isolates transgressive segregates in the further generations for the development of superior cultivars suitable for late rice fallows situation under Pennar delta of Andhra Pradesh.

**Key words :** Combining Ability, Greengram, LXT Design Late Rice Follows.

Research genetic improvement of cultivars for late rice-fallows (sown in the month of January/ February), which is a common practice in Nellore district under Pennar delta in Andhra Pradesh, is rarely attempted. Hence, the present investigation to study the genetic analysis of various yield and yield related traits so as to breed an ideal greengram plant type for late rice fallows of Nellore district of Andhra Pradesh.

### MATERIAL AND METHODS

Experimental material comprised five lines (LGG-410, LGG-460, MGG-341, PUSA-9672 and Podalakuru local) and four testers (LGG-407, WGG-2, TARM-21 and LGG-410) which were mated in a line X tester design to get twenty cross combinations. The crosses along with their parents were raised in randomized block design with three replications, during late rabbi 1999-2000 under rice fallows at Agricultural Research Station, Nellore. The plot size comprised two rows of 4 mts length by adopting an inter- and intra- row spacing of 30 X 10 cm, respectively. Recommended cultural practices for crop were adopted. Observations were recorded on ten randomly selected plants for plant height, pods per plant, seeds per pod, 100 seed weight and seed yield per plant. However, for days to 50% flowering, days to maturity and seed protein the data were recorded on plot basis. Mean values were subjected to analysis of variance and combining ability analysis was attempted as per Kempthorne (1957).

### RESULTS AND DISCUSSION

The analysis of variance for combining ability (Table 1) indicated that mean square due to lines showed significant variation for all the traits except for seed protein, while all the testers had significant differences for all the traits. Further the variance due to testers was higher than that of the lines for all the characters. The interaction with male and female parents had also showed significant differences for all the traits, which indicates that experimental materials possessed considerable variability. The *gca* variances were higher than the *sca* variances for most of their traits except days to maturity. The ratio between *gca* and *sca* components of variance were intermediate to unity for days to 50% flowering, days to maturity, pods per plant, 100 seed weight and yield per plant, indicating the importance of both additive and non-additive gene actions for these traits. These findings are agreement with Saxena and Sharma (1992) for yield for plant and 100 seed weight; Bhadra and Akhtar (1993) for days to 50% flowering and pods per plant. However the ratio between *gca* and *sca* components of variance was close to unity per plant height, seeds per pod and seed protein indicating the predominance of additive gene action in these characters. Similar findings were also observed by Reddy et. al., (1992) for plant height and Raghurami Reddy (1980) for seed protein and seeds per pod. Hence, these traits governed by additive genes could be improved through breeding methods involving simple selection.

Table 1. ANOVA for combining ability for different characters in greengram

Source	df	Days to Flowering	Days to Maturity	Plant Height (cm)	Pods plant <sup>-1</sup>	Seeds pod <sup>-1</sup>	100 seed weight (g)	Seed protein (%)	Yield Plant <sup>-1</sup> (g)
		Mean squares							
Replications	2	0.27	0.15	17.93	1.42	0.06	0.08	0.008	1.65
Lines	4	167.08*	121.93**	579.79**	303.91*	4.31*	2.15*	6.68	180.07*
Testers	3	251.08*	251.42*	965.81**	336.24**	12.36**	3.04*	100.25**	32.04**
Linesx testers	12	45.86**	67.31**	117.19**	76.57	1.17**	0.60**	5.32**	53.70**
Error	38	3.69	6.22	7.92	13.22	6.20	0.04	0.55	3.30
$\sigma^2_{gca}$		24.18	17.68	97.01	36.07	1.06	0.30	7.13	29.39
$\sigma^2_{sca}$		14.06	20.36	36.69	21.12	0.32	0.19	1.59	16.88
$2\sigma^2_{gca} / 2\sigma^2_{gca} + \sigma^2_{sca}$		0.78	0.64	0.84	0.77	0.87	0.76	0.90	0.78

df = degrees of freed gm \* Significant 5% probability level \*\* Significant 1% probability level

Table 2. General combining ability effects of parents for different characters in greengram.

Parent	Days to Flowering	Days to Maturity	Plant Height (cm)	Pods plant <sup>-1</sup>	Seeds pod <sup>-1</sup>	100 seed weight (g)	Seed protein (%)	Yield Plant <sup>-1</sup> (g)
LGG-410	-1.92**	-1.77**	-2.49**	-2.55**	0.02	-0.09**	0.60**	-2.78**
LGG-460	0.92*	0.23	0.56	-0.37	0.53**	0.13**	0.23	0.25
MGG-341	0.42	-0.10	1.06	0.11	0.60**	-0.17**	0.27	-0.22
PUDS-9672	5.33**	5.07**	10.06**	8.14**	-0.33**	0.74**	0.20	6.29**
Local	-4.75**	-3.43**	-9.19**	-5.33**	-0.83**	-0.34**	-1.30**	-3.55**
SE	0.41	0.53	0.60	0.78	0.10	0.04	0.16	0.39
LGG-407	4.18**	4.33**	10.46**	6.64**	1.23**	0.48**	3.28**	6.74**
WGG-2	0.45	1.27**	1.69**	-2.45**	0.13	0.00	0.02	-0.61
TARM-21	0.98**	-0.13	-4.18**	-0.04	-0.55**	0.13**	-0.26	-2.77**
LGG-440	-5.62**	-5.47**	-7.97**	-4.15**	-0.81**	-0.60**	-3.04**	-3.35**
SE	0.36	0.46	0.52	0.68	0.08	0.04	0.14	0.34

\* Significant 5% probability level \*\* Significant 1% probability level

procedures like pedigree method. Whereas, the traits governed by both additive and non-additive genes could be improved through recurrent selection or biparental mating in early stages followed by selection.

The estimate of general combining ability indicated that (Table 2) the line Pusa – 9672 and the tester LGG-407 were found to be good general combiners for seed yield per plant. The line Pusa - 9672 was also found to be good general combiner for all characters studied except for seed per pod and seed protein content. Similarly the tester LGG-407 was also found to be good general combiners to all the yield component characters. Hence, these genotypes could be well utilized as potential parents

for improvement of greengram cultivars for the late rice follows system. Among the cross combinations LGG-460xLGG-407, MGG-341xLGG-407, Pusa-9672xWGG-2, Pusa-9672xTARM-21, Pusa-9672xLGG-440 and LocalxLGG-440 showed good specific combining ability for most of the traits in favorable directions (Table 3) combining with high mean values for seed yield per plant. Therefore, breeding procedures involving cyclic hybridization which can optimize both additive and non-additive gene actions could be adapted to isolate transgressive segregates in the further generations for the development of superior cultivars suitable for late rice follows situation under Pennar delta of Andhra Pradesh.

Table 3. Specific combining ability effects of crosses for different characters in greengram.

Parent	Days to Flowering	Days to Maturity	Plant Height (cm)	Pods plant <sup>-1</sup>	Seeds pod <sup>-1</sup>	100 seed weight (g)	Seed protein (%)	Yield Plant <sup>-1</sup> (g)
LGG-410 X LGG-407	1.98**	8.17**	-2.25*	7.58**	0.20	0.14*	-0.22	4.04**
LGG-410 X WGG-2	-0.28	-1.77	0.02	-6.59**	-0.41	0.26**	-1.41**	-3.45**
LGG-410 X TARM-21	0.85**	0.97**	1.22	0.25	-0.46**	-0.15**	0.32	-0.34
LGG-410 X LGG-440	-2.55**	-7.37**	1.01	-1.23	0.40*	-0.25**	1.31**	-0.26
LGG-460 X LGG-407	-2.18**	-2.50**	6.87**	3.41*	-0.17	-0.08	-0.61*	2.81**
LGG-460 X WGG-2	0.55	0.57	5.97**	5.94**	-0.14	0.41**	-0.26	3.38**
LGG-460 X TARM-21	1.68*	3.97**	-10.83**	-5.24**	-0.59**	-0.18**	1.45**	-3.38**
LGG-460 X LGG-440	-0.05	-2.03**	-2.00	-4.11**	0.90**	-0.15**	-0.58**	-2.82**
MGG-341 X LGG-407	-0.02	-1.50	-1.62	-4.50**	-0.60	0.02	-0.05	4.60**
MGG-341 X WGG-2	6.38**	4.90**	-0.86	1.24*	0.45**	0.03	-0.78**	-1.43**
MGG-341 X TARM-21	-3.48**	-3.03**	1.68	1.58*	-0.37	-0.25**	0.54	-2.38**
MGG-341 X LGG-440	-2.88**	-0.37	0.80	1.69	-0.01	0.19*	0.29	-0.80
PUSA-9672 X LGG-407	-3.27**	-4.00**	-7.96**	-5.00**	0.56**	-0.75**	-0.12	-8.00**
PUSA-9672 X WGG-2	0.13	-0.27	5.14**	3.86**	-0.18	0.06	0.03	2.69**
PUSA-9672 X TARM-21	-1.73*	-1.87*	3.68**	-0.65	0.40*	0.51**	0.02	1.86**
PUSA-9672 X LGG-440	4.87**	6.13**	-0.86	1.79	-0.77**	0.18**	0.07	3.45**
LOCAL X LGG-407	3.48**	-0.17	4.96**	-1.50	0.52**	0.68**	1.01**	-3.46**
LOCAL X WGG-2	-6.78**	-3.43**	-10.27**	-4.44**	0.01	-0.76**	2.42**	-1.20**
LOCAL X TARM-21	2.68**	-0.03	4.26**	4.06**	1.02**	0.06	-2.33**	4.23**
LOCAL X LGG-440	0.62	3.63**	1.05	1.87	-0.52**	0.02	-1.10**	0.42
Standad error	0.71	0.93	1.05	1.35	0.17	0.07	0.28	0.67

\* Significant 5% probability level

\*\* Significant 1% probability level

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