

# COMBINING ABILITY ANALYSIS IN *CAPSICUM ANNUUM*

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**Abstract:** Combining ability analysis revealed the preponderance of additive gene action for green fruit yield per plant in chilli. Non-additive gene action controlled expression of plant height and days to first green fruit harvest.

## INTRODUCTION

In *Capsicum annuum* L. there are different botanical varieties. Varieties like Pant C-1 and KAU Cluster are popular, grown in the warm humid tropics. The varieties like Hungarian Wax, Sweet Red Cherry Pickling, Early Calwonder, Cubanelle and Yolo Wonder Improved are recent introductions from the USA. Attempts are made to transfer adaptability from Pant C-1 and KAU Cluster to the above introductions. Information on gene action of the more important quantitative characters is sought through a line x tester approach.

## MATERIALS AND METHODS

The materials comprised of five varieties of *Capsicum annuum* var. *grossum*, (Hungarian Wax, Sweet Red Cherry Pickling, Early Calwonder, Cubanelle and Yolo Wonder Improved) and one variety in each of var. *longum* (Pant C-1) and var. *fasciculatum* (KAU cluster). Ten hybrids were developed through hand emasculation and pollination using the five varieties of *Capsicum annuum* var. *grossum* as female parents (lines) and Pant C-1 and KAU cluster as male parents (testers). The ten hybrids along with the seven parents were grown in a randomised block design with three replications during December 1985 to April 1986. There were 30 plants/genotype/replication. The spacing was 60 cm x 45 cm. The quantitative characters observed were plant height (cm),

primary branches per plant, days to first green fruit harvest and green fruit yield per plant. General combining ability effects of different parents and specific combining ability effects of hybrids were worked out based on the methods suggested by Kempthorne (1957).

## RESULTS AND DISCUSSION

Line x tester analysis was done to estimate general combining ability (gca) effects and specific combining ability (sca) effects. A comparison of parents vs hybrids revealed highly significant differences between parents and hybrids for most of the characters studied (Table 1).

The differences among the testers were non-significant for all characters. Estimates of general and specific combining ability effects are presented in Tables 2 and 3 respectively.

A significant positive estimate of gca effect was observed in Yolo Wonder Improved (3.38) and Cubanelle (3.63) for plant height. Among the parents, Hungarian Wax had the highest gca effect for green fruit yield per plant. Maximum sca effect was noted in Early Calwonder x Pant C-1 and Yolo Wonder Improved x KAU Cluster.

Estimates of variance due to gca and sca effects were made (Table 4). Higher estimates of  $\sigma^2_{sca}$  observed for plant height and days to first green fruit

Table 1. Analysis of variance for line x tester analysis

Components of variation	Mean squares			
	Plant height	Primary branches/plant	Days to first green fruit harvest	Green fruit yield/plant
Replications	23.16	0.96	15.58	1562
Genotypes	66.98"	14.75"	193.25"	15001**
Parents	75.67"	36.35*	294.55"	5790"
Parents vs crosses	142.83"	4.86"	564.40"	185417"
Crosses	52.77"	1.05	37.99	918.94*
Lines	54.72	1.37	22.96*	1552*
Testers	0.07	2.42	35.21	1162*
Lines x testers	63.99"	0.39	55.30*	225.03
Error	7.41	0.58	13.41	376.25

\* Significant at 5% level

\*\* Significant at 1% level

Table 2. General combining ability effects

	Plant height	Primary branches/plant	Green fruit yield/plant	Days to fruit green fruit harvest
Lines				
Hungarian Wax	0.55	0.01	30.37*	-0.90
Sweet Red Cherry Pickling	-2.98*	-0.31	-4.69	4.14
Early Calwonder	-4.57"	-0.44	-23.34*	-1.37
Cubanelle	3.63*	1.01*	-6.65	-3.31
Yolo Wonder Improved	3.38*	-0.26	4.71	1.26
Testers				
KAU Cluster	0.03	-0.38	4.71	0.74
Pant C-1	-0.03	0.35	7.62	-0.74
SE (gi) lines	1.36	0.38	9.69	1.83
SE (gj) testers	0.86	0.24	6.13	1.49
SE (gi-gj) lines	1.92	0.54	13.72	2.59
SE (g'-gj) testers	1.22	0.34	8.67	2.11

\* Significant at 5% level

\*\* Significant at 1% level

Table 3. Specific combining ability effects

Hybrids	Plant height	Primary branches/ plant	Days to first green fruit harvest	Green fruit yield/ plant
Hungarian Wax x KAU Cluster	+2.01	-0.12	0.37	-3.62
Hungarian Wax x Pant C-1	-2.01	0.12	-0.37	3.62
Sweet Red Cherry Pickling x KAU Cluster	-3.33	+0.16	1.58	1.94
Sweet Red Cherry Pickling x Pant C-1	3.33	-0.16	-1.58	-1.94
Early Calwonder x KAU Cluster	0.03	0.04	1.83	-11.04
Early Calwonder x Pant C-1	-0.03	-0.04	-1.83	+11.04
Cubanellex KAU Cluster	0.62	0.12	-1.88	6.03
Cubanelle x Pant C-1	-0.62	-0.12	1.88	-6.03
Yolo Wonder Improved x KAU Cluster	0.66	-0.20	-1.92	6.94
Yolo Wonder Improved x Pant C-1	-0.66	0.20	1.92	-6.94
SE (Sij)	1.92	0.54	2.58	13.82
SE (Sij-Skl)	2.72	0.75	3.66	19.39

harvest indicated the preponderance of non-additive gene action for these characters. High  $a^2$  gca for green fruit yield per plant indicated the involvement of additive gene action for this character. Preponderance of additive gene action

for green fruit yield was observed earlier by Lippert (1975), Milkova (1979) and Gopalakrishnan (1985). Hence, significant advancement could be achieved in the segregating generations using simple selection procedures.

Table 4. Estimates of variance components of general combining ability ( $\sigma^2_g$ , specific combining ability ( $\sigma_s$ ) and Rg value

Characters	$\sigma^2_s$	$tf^g$	Rg
Plant height	28.29	5.96	0.29
Primary branch/plant	-0.06	0.05	3.24
Days to first green fruit harvest	20.95	-4.81	-0.85
Green fruit yield/plant	25.64	27.85	0.68

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