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LINE x TESTER ANALYSIS OF COMBINING ABILITY IN SNAKEGOURD (*TRICHOSANTHES ANGUINA* L.)

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ABSTRACT

Line x tester analysis was conducted in snakegourd to study the combining ability among different lines. The gca effects were significant for yield/plant and fruits/plant for the lines TA-102, TA-100 and TA-89. The accessions TA-82 and TA-77 were good combiners for earliness. The crosses TA-89 x TA 41, TA-77 x TA-41, TA-102 x TA-70 and TA-102 x TA-99 exhibited high sca effects for yield/plant and fruits/plant. The crosses TA-77 x TA-70, TA-87 x TA-41 and TA-89 x TA-41 showed high negative sca effects for days to first fruit picking.

Key words: Combining ability, *Trichosanthes anguina* L., snakegourd.

In the recent past, exploitation of hybrid vigour and selection of parents on the basis of combining ability has been used as an important breeding approach in crop improvement. Development of high yielding F_1 hybrids along with other favourable traits are receiving considerable attention. For developing good hybrids, information about combining ability of the parents and the resulting crosses is essential. In spite of the economic importance of snakegourd as a vegetable crop, information on these aspects is practically quite meagre. Crossability among a few species showed that *Trichosanthes anguina*, *Trichosanthes cucumerina* and *Trichosanthes lobata* did not differ from each other [1]. Hybrids between *Trichosanthes anguina* and *Trichosanthes cucumerina* had intermediate fruit size [2]. Monogenic semidominant inheritance of fruit size in snakegourd has been reported [3]. The present study involving a line x tester analysis aimed to determine the combining ability of 11 parents for various traits.

MATERIALS AND METHODS

For assessment of combining ability of the parents, 8 lines and 3 testers were used. The testers were chosen to cover a wide genetic base using the prior information available on the source materials. The genotypes used as lines were TA-77, TA-19, TA-30, TA-82, TA-102, TA-100, TA-87 and TA-89 and the testers were TA- 99, TA-70 and TA-41. The parents along

with 24 F_1s were evaluated in randomized block design with two replications. There were three pits/replication with one plant/pit. The cultural practices, plant protection measures and fertilizer application were done as per "Package of Practices Recommendations" of the Kerala Agricultural University [4]. The Kempthorne's method [5] for covariance of half-sibs and full-sibs was used to obtain estimates of general and specific combining effects (gca, sca) and variance for characters under study (Table 1).

Table 1. Character means and estimates of general combining ability of parents in snakegourd

Lines	Days to female flower		Days to maturity		Days to fruit picking		Yield/plant (kg)		Fruits per plant		Fruit length (cm)		Fruit girth (cm)	
	mean	gca	mean	gca	mean	gca	mean	gca	mean	gca	mean	gca	mean	gca
Females:														
TA-77	41.5	-0.7	12.0	0.16	55.0	-0.3	10.3	-0.6	39.0	-1.0	37.3	4.4	15.0	-2.1
TA-19	48.3	1.4	10.0	0.4	59.3	1.7	16.0	0.5	21.0	0.4	40.0	2.6	27.9	0.9
TA-30	42.0	-0.6	12.0	-0.6	59.0	-0.9	10.3	0.1	31.3	0.6	33.0	-7.1	22.8	1.2
TA-82	41.8	-0.6	13.0	0.0	54.5	-0.7	10.7	-1.3	24.8	3.5	74.5	3.7	14.7	-2.2
TA-102	46.3	1.4	12.0	-0.3	58.5	1.6	8.0	1.4	12.6	-9.7	51.5	5.7	20.0	2.4
TA-100	46.0	0.9	13.0	0.0	44.8	0.3	11.1	-1.6	19.7	-7.4	49.5	1.5	24.0	2.9
TA-87	34.5	-2.1	10.0	-0.7	58.5	-2.7	11.8	-4.4	42.6	-1.5	30.7	-7.9	16.8	0.5
TA-89	45.8	-0.3	11.0	-0.3	58.5	-0.2	17.7	-0.9	43.0	5.3	41.0	-8.0	20.0	-1.0
Males:														
TA-99	41.5	1.2	15.0	0.0	57.5	1.7	16.0	2.0	23.5	6.0	72.0	-0.6	21.6	-1.1
TA-70	50.0	-1.3	13.0	1.3	63.5	-0.1	10.9	2.6	15.4	-0.5	52.5	3.2	17.6	-1.6
TA-41	40.5	0.7	13.0	0.0	58.5	0.3	10.9	2.1	28.0	4.4	75.0	2.4	13.0	-1.9

RESULTS AND DISCUSSION

The common approach of selecting parents on the basis of per se performance does not necessarily lead to the best results in a hybridization programme [6]. Selection of best parents based on complete genetic information and knowledge of combining ability leads to fruitful results in the identification of promising F_1 hybrids. The present study has shown that mean squares for progenies were significant for all the characters, indicating adequate genetic variability. Variances due to gca were significant for all the characters studied. The sca variances were also significant for all the characters except for total crop duration, sex ratio, and fruits/plant.

The magnitude of gca variance was much higher than that of sca effect for female flowers/plant. This indicated preponderance of additive type of gene action.

It was noted that the parents with high gca effect for yield/plant and other characters also gave good per se performance. The high yielding parents TA-102, TA-100 and TA-89 also displayed significant gca effects for yield coupled with high gca for fruits/plant. This shows that these female parents transmit their specific genetic architecture to the offspring. The parents TA-82 and TA-77 gave the highest negative gca effects for the first harvest. The parent TA-82 showed highest negative gca effect for first female flower opening, days to fruit maturity, days to first fruit picking, and fruit length. The parents TA-30 and TA-19 showed high gca effects for fruit girth. The high gca effects observed for different characters could be helpful in identifying outstanding parents with favourable alleles for different components of yield and quality.

The means and sca effects of the crosses (Table 2) show that the crosses TA-89 x TA-41, TA-77 x TA-41, TA- 102 x TA-70 and TA 102 x TA-99 had significant sca effect for yield. The crosses with high specific combining ability for fruits/plant were TA-89 x TA- 41, TA-77 x

Table 2. Character means and estimates of sca effects of promising F_1 hybrids for various characters of snakegourd

Cross	Days to fruit picking		Yield/plant (kg)		Fruits/ plant		Fruit length (cm)		Fruit girth (cm)		Fruit weight (g)	
	mean	sca	mean	sca	mean	sca	mean	sca	mean	sca	mean	sca
TA-19 x TA-99	53.0	-0.04	17.4	0.4	22.0	-1.0	23.0	-2.8	23.0	3.7	740.0	97.7
TA-82 x TA-99	50.0	1.3	10.5	-0.7	35.0	-0.7	17.0	-5.8	17.0	-0.4	332.0	-35.7
TA-102 x TA-99	52.5	1.3	16.2	1.5	49.5	3.5	17.5	3.7	17.5	-0.4	350.0	-44.0
TA-87 x TA-99	51.0	-0.5	18.0	0.2	40.0	6.3	17.0	-9.1	17.0	1.9	438.0	-40.2
TA-77 x TA-70	54.0	1.8	14.5	-0.7	37.5	-0.1	19.0	1.3	19.6	1.5	400.0	-70.5
TA-30 x TA-70	56.0	2.8	15.9	0.8	26.5	-0.6	26.0	-1.5	26.0	3.3	600.0	9.3
TA-102 x TA-70	53.0	0.3	17.5	1.8	38.0	3.6	20.0	-1.5	20.0	-0.9	515.0	44.8
TA-100 x TA-70	55.0	-1.1	18.6	0.0	45.0	4.4	15.0	3.6	15.0	-3.7	450.0	-3.8
TA-30 x TA-41	51.0	-0.1	14.3	-0.4	28.0	0.9	21.4	-8.3	21.4	-1.5	461.0	-24.9
TA-100 x TA-41	52.0	1.0	17.5	-0.73	34.5	-1.2	22.3	-6.4	22.3	3.2	413.0	29.0
TA-87 x TA-41	52.0	1.8	18.3	-0.7	38.0	-3.9	16.7	6.7	16.7	-1.7	498.0	22.0
TA-89 x TA-41	52.0	1.6	21.0	2.6	54.0	6.1	20.2	-4.5	20.2	1.9	370.0	-25.9
TA-77 x TA-41	47.0	-3.1	16.8	1.8	42.0	4.3	19.0	1.1	19.0	1.1	432.0	29.8

TA-41, TA-102 x TA-99, TA-102 x TA-70, TA-100 x TA-70 and TA-87 x TA-99. High negative sca effects for days to first fruit harvest were exhibited by the crosses TA-77 x TA-70, TA-87 x TA-41 and TA-89 x TA-41. The crosses TA-19 x TA-99 and TA-30 x TA-70 showed high sca effects for fruit girth. For fruit length, high negative sca effects were observed in the crosses TA-82 x TA-99, TA-30 x TA-41 and TA-100 x TA-41. These crosses thus hold considerable promise of releasing desirable segregates in subsequent generations. Most of the above mentioned crosses had parents with high gca effects for the corresponding traits. High gca of the parents, therefore, seems to have some association with sca. Generally, the high sca crosses for yield some exhibited high or average sca for its components. Significant gca and sca values were obtained for vine length, fruits/plant, fruit weight, yield/plant, fruit diameter, flesh thickness and seeds/fruit in watermelon [7] and in bittergourd [8, 9]. For the improvement of such characters recurrent selection could be the most appropriate approach.

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