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Genetic Analysis for Green Pod Yield in Table Pea (*Pisum sativum* L. var. *hortense*)

Pratyksh Pandey[1], K.P. Singh[1], Harshit Tripathi[2*], H.C. Singh[2], Pawan Kumar Saini[2], Budhesh Pratap Singh[1], R.B. Singh[1] and Arun Kumar Verma[1]

[1]Department of Vegetable Science,
C.S. Azad University of Ag. &Tech., Kanpur (Uttar Pradesh), India.
[2]Department of Genetics and Plant Breeding,
C.S. Azad University of Ag. & Tech., Kanpur (Uttar Pradesh), India.

(Corresponding author: Harshit Tripathi)*

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ABSTRACT: An experiment consisting 43 diverse genotypes of table pea including 10 lines, 3 testers and their F1s were evaluated during Rabi 2020-21 at Vegetable Research Farm, Kalyanpur of C. S. Azad University of Agriculture and Technology, Kanpur. Highly significant mean squares differences were observed due to lines, testers, F1s, line×tester and parents *vs.* F1s for green pod yield and its contributing characters i.e. days to 50% flowering, node number of first flower, inter-nodal length, number of primary branches, days to first picking of pods, average pod length, number of pods per plant, average pod weight, number of seeds per pod, plant height, seed shell per cent. The mean square due to GCA and SCA were also highly significant for all characters. The estimates of σ^2sca were higher than respective σ^2gca for all the characters except days to 50% flowering, node number of first flower, average pod length and plant height. All the characters showed higher magnitude of σ^2s than σ^2g on pooled basis also.

Genotypes namely KS-701 (14.72), AP-5 (13.66) and GS-10 (2.29) were as good general combiners based on GCA effect and mean performance. The cross combination KS-702×GS-10was found best specific cross combination for maximum green pod yield per plant, followed by AP-1×AP-3 (24.67), KS-701×GS-10 (22.06) and AP-1×C-18-3 (19.37). The specific cross combinations namely; KS-602×C-18-3, KS-802×GS-10, KS-801×AP-3 and AP-4×C-18-3 were desirable for early flowering. KS-702, KS-221and KS-701 were the good general combiners for early flowering.

Keywords: Table pea, *Pisum sativum,* Line×Tester, hybrids, GCA and SCA.

INTRODUCTION

Table pea (*Pisum sativum* var. *hortense*) being a self-pollinated crop possessing cleistogamous mechanism where flower does not open at all even after the pollination completed and an improvement in pod yield of self-pollinated is influenced mainly through selection of genotypes with desirable characters from the diversity through selection process. The ability of parents to combine well depends on the interactions among genes and it cannot be estimated by mere yield performance of the parents. Therefore, the knowledge of combining ability and nature of gene effects is necessary for the selection of best parents for hybridization to improve the selected genotypes. Although, some information on additive and non-additive effects associated with yield and yield attributing traits in table pea is available but that is relevant to the specific region, genetic material involved and particular environmental conditions. Sprague and Tatum (1942) defined general combining ability as the average performance of a line in hybrid combinations, while specific combining ability refers to those cases in which certain combinations do relatively better or worse than would be expected on the basis of average performance of the lines involved. Therefore, the present investigations were carried out to obtain information regarding general and specific combining ability effects on green pod yield and its attributing traits in table pea.

MATERIALS AND METHODS

The present research was carried out at Vegetable Research Farm, C. S. Azad University of Agriculture and Technology, Kanpur. Thirteen parents (10 lines *viz.*AP-1, AP-2, AP-4, AP-5, KS-602, KS-701, KS-702, KS-801, KS-802 and KS-221 and 3 testers namely GS-10, AP-3 and C-18-3) were crossed in line×tester design during *Rabi* 2019-20 while, sown to observe the general combining ability and specific combining ability in the *Rabi* 2020-21 with the spacing of 45 cm × 10 cm among the rows and plants respectively. All the recommended package of practices was applied for a healthy crop growth. The data were collected for days to 50% per cent flowering, node number of first flower, inter-nodal length, number of primary branches, days to first picking of pods, average pod length, number of pods per plant, average pod weight, number of seeds per pod, average plant height, seed shell per cent, green pod yield per plant at appropriate stage of the crop from five random plants from each line and each replication. The analysis of variance was done for all the characters as per the method suggested by Kempthorne (1957).

RESULT AND DISCUSSION

The combined ANOVA of combining ability for various characters are presented in Table 1. The mean sum of squares for crosses was highly significant for all the characters except variance due to testers for average pod weight (g.). Whereas, variances due to the lines it was highly significant for all the characters, due to testers variance was found non-significant for average pod weight. The estimates of σ^2gca due to male were found to be lower than σ^2g due to females for average pod length and number of seed per pod. σ^2gca due to females were higher than σ^2gca due males for all the characters except average pod length and number of seeds per pod. The estimates of σ^2s were found to be higher for all the characters except days to 50% flowering, node number of first flower, average pod length and plant height and all the characters had shown higher magnitude of σ^2sca than σ^2gca (pooled).The proportional contribution of lines, testers and line × tester to total hybrid variances for different traits where the contribution of lines and testers was lower than the line × tester for all the characters, the lines were prone to more contributory against testers for all of the traits studied.

The variance of GCA for the parents, SCA for the hybrids and the ratio of GCA and SCA were presented in Table 2 and 3 respectively. Various characters studied from the above investigation stated that out of all the fifteen characters most of them showed pre-dominance of additive gene action where ratio of GCA and SCA variance greater than unity also recorded by Singh and Dhall (2018); Manjunath *et al*. (2020) as they individually observed SCA and GCA variance ratios for majority of the traits like plant height, number of pods per plant *etc*.

A. General and specific combining ability effects

The estimation of general and specific combining ability effects of the parents and hybrids involved in the present investigation presented in Table- 2 and 3 respectively.

The GCA effects among females for the traits days to 50% flowering, node number of first flower, inter-nodal length, days to first picking and average plant height were observed highest desirable negative and significant for KS-702 (-5.56), AP-1 (-1.43), KS-701 (-1.01), KS-602 (-5.04) and KS-701 (-31.97 respectively. Among the testers GS-10 expressed negative and significant values for the traits days to 50% flowering (-1.71) and days to first picking (-1.06) GCA effects for above mentioned traits showed desirable negative significant values for GS-10 (-1.71), while AP-3 was desirable and negatively significant for node number of first flower (-0.50) and C-18-3 for desirable for inter-nodal length (-0.15) and plant height (-5.33). Among females AP-1 for number of seeds per plant (1.41), AP-2 for maximum lysine content (0.09), AP-4 for iron content (0.02), AP-5 for green pod yield per plant (14.68), KS-701 for average pod length (0.40) and average pod weight (0.74), KS-702 for number of pods per plant (6.39), KS-802 for seed shell per cent (3.93) and KS-221 for number of primary branches (0.60) and protein content per cent (1.20) were recorded desirable significant with positive values, while among testers GS-10 for average pod length (0.21), number of pods per plant (0.94), average pod weight (0.03), number of seeds per pod (0.20) and green pod yield per plant (2.29), AP-3 for seed shell per cent (0.32), protein content (0.32) and lysine content (0.05) and C-18-3 for number of primary branches (0.11) were reported for desirable with positively significant values. Significant values with undesirable signs among lines for the traits days to 50% flowering in AP-2 (5.89), node number of first flower in KS-602 (1.18), inter-nodal length in AP-5 (0.88), number of primary branches in KS-221 (0.60), days to first picking of pods in AP-1 (11.07), average pod length in KS-801 (-0.45) number of pods per plant in AP-2 (-7.14), average pod weight in KS-702 (-0.64), number of seeds per pod in KS-801 (-1.23), Average plant height in KS-801 (35.81), seed shell per cent in AP-2 (-3.99), protein content in KS-801 (-1.47), lysine content in KS-221 (-0.11), iron content in AP-1 (-0.01), AP-5 (-0.01) and KS-801 (-0.01) and for green pod yield per plant in AP-1 (-9.11) while among testers it was noted for the traits days to 50% flowering in C-18-3 (2.66), node number of first flower in C-18-3 (0.52), inter-nodal length in GS-10 (0.20), number of primary branches in C-18-3 (0.11), days to first picking of pods in C-18-3 (1.18), average pod length in AP-3 (-0.16) number of pods per plant in AP-3 (-1.52), average pod weight in AP-3 (-0.03), number of seeds per pod in AP-3 (-0.19), Average plant height in AP-3 (3.86), seed shell per cent in GS-10 (-0.26), protein content in C-18-3 (-0.35), lysine content in GS-10 (-0.06), and for green pod yield in AP-3 (-3.14). The above results for the GCA effects were accordance to the findings of Singh and Singh *et al*. (2003); Zaman and Hazarika *et al*. (2005); Singh *et al*. (2010); Sharma *et al*. (2015); Katoch *et al*. (2019); Kumar *et al*. (2021); Faiza *et al*. (2021) for pod yield and majority of its components.

The specific combining ability effects for all the F_1 hybrids were observed and reported that the highest significant values with concerned desirable signs in cross combinations for traits namely days to 50% flowering in KS-602×C-18-3 (-8.07), node number of first flower in cross KS-702×AP-3 (-2.17), inter-nodal length in cross AP-5×AP-3 (-1.61), number of primary branches in cross AP-1×GS-10 (0.72), days to first picking of pods in KS-602×GS-10 (-9.88), average pod length in AP-1×AP-3 (0.94), number of pods per plant in cross AP-5×AP-3 (7.96), average pod weight in KS-801×C-18-3 (0.98), number of seeds per pod in KS-602×C-18-3 (1.87), average plant height in KS-702× GS-10 (-44.29), seed shell per cent in cross AP-4×GS-10 (4.42), protein content per cent in KS-221× GS-10 (2.42), lysine content in crosses KS-701×GS-10 (0.12), KS-602×AP-3 (0.12) and KS-802×AP-3 (0.12), iron content in KS-802×GS-10 (0.02), KS-802×AP-3 (0.02) and KS-602×C-18-3 (0.02) and for green pod yield per plant cross KS-702× GS-10 (32.09). The results for the SCA effects observed in present investigation were similar to the findings of Bhardwaj and Kohli *et al*. (1998); Sharma *et al*. (2015); Singh and Dhall (2018); Kumar *et al*. (2020); Suchitra and Anita (2022).

Cross combinations namely; KS-702 × GS-10, AP-1× C-18-3 showed high SCA effects with mean value for green pod yield per plant. The genetic combination of the parents involved in these crosses showed high x low combination means one with desirable gca effect and other with undesirable one. It might be due to involvement of additive × dominance epistatic combinations which may produce desirable transgressive segregates in advance generation when positive effect of one parent and negative effect of other goes in same direction. The cross combinationKS-701×GS-10 showed high SCA effects with involvement of both the parents with positive and significant GCA status. It showed the involvement of additive×additive epistasis which may arises due to involvement of diverse parents. The cross combination AP-1×AP-3 showed high SCA effect for green pod yield with both the parents of this cross had low × low GCA status means presence of dominance × dominance epistasis and could not be useful in self-pollinated crops like table pea. Although low × low GCA status of this cross revealed that the cross may be utilized for heterosis breeding for development of superior hybrids in presence of suitable male sterility system. Rewale *et al*. (2003); Kumar *et al*. (2006) were in favour of these results.

Table 1: Estimates of components.

Estimates	Days to 50% flowering	Node no. of first flower	Inter-nodal length(cm.)	No. of primary branches	Days to first picking of pods	Average pod length (cm.)	No. of pods per plant	Average pod weight (g.)	No. of seeds per pod	Plant height (cm.)	Seed shell %	Protein content %	Lysine content (% of protein)	Iron content (mg/100g)	Green pod yield per plant (g.)
COV(HS)	0.44	0.04	0.00	0.00	0.70	0.00	0.02	0.00	-0.01	-4.19	0.10	-0.007	0.00020	0.00000	-1.79
COV(FS)	36.19	2.36	0.87	0.19	33.67	0.30	36.93	0.34	1.30	1089.89	9.83	1.998	0.01780	0.00020	190.02
σ^2A	0.88	0.07	0.00	0.00	1.41	-0.01	0.03	0.00	-0.03	-8.37	0.20	-0.013	0.00040	0.00000	-3.57
σ^2D	19.90	1.49	1.03	0.21	25.20	0.34	43.52	0.46	1.95	1490.17	10.66	2.446	0.00960	0.00020	271.09
σ^2g (female)	5.90	0.59	0.09	0.03	14.46	-0.06	2.27	0.04	-0.17	14.08	2.67	-0.028	0.00232	0.00002	-19.61
σ^2g (male)	3.42	0.11	-0.07	-0.01	-1.30	0.00	-2.65	-0.04	-0.16	-127.24	-0.98	-0.130	0.00189	-0.00001	-19.69
σ^2g (pooled)	4.00	0.22	-0.04	0.00	2.33	-0.01	-1.51	-0.03	-0.16	-94.63	-0.14	-0.107	0.00199	-0.00001	-19.67
σ^2s (sca)	19.90	1.49	1.03	0.21	25.20	0.34	43.52	0.46	1.95	1490.17	10.66	2.446	0.00948	0.00019	271.09
A/D Degree Dominance	4.75	4.61	16.50	10.77	4.23	-	36.54	47.71	-	-	7.24	-	4.90	-	-
Prediction ratio	0.04	0.04	0.00	0.01	0.05	-0.02	0.00	0.00	-0.02	-0.01	0.02	-0.01	0.04	0.00	-0.01
% cont. (line)	41.96	47.78	37.80	39.37	56.08	19.08	35.61	38.05	26.75	33.59	46.46	31.46	39.33	39.00	27.60
% cont. (tester)	13.40	8.39	2.02	2.80	2.27	8.55	2.73	0.15	1.54	1.09	0.48	3.38	15.02	2.50	2.24
% cont. (L x T)	44.64	43.83	60.18	57.83	41.64	72.37	61.66	61.80	71.71	65.33	53.06	65.17	45.65	61.00	70.16
Narrow heritability (%)	4.11	4.39	0.34	0.72	5.07	-1.55	0.07	0.04	-1.52	-0.56	1.86	-0.53	3.82	0.00	-1.27

Table 2: General combining ability effects.

Sr. No.	Parents	Days to 50% flowering	Node no. of first flower	Inter-nodal length	Number of primary branches	Days to first picking of pods	Average pod length	Number of pods per plant	Average pod weight	Number of seeds per pod	Average plant height	Seed shell %	Protein content %	Lysine content(% of protein)	Iron content (mg/100g)	Green pod yield per plant
	Lines															
1	**AP-1**	2.00 **	-1.43 **	0.08	-0.22 **	11.07 **	-0.12 *	-1.45 **	-0.35 **	1.41 **	20.96 **	-0.08	-0.97 **	-0.08 **	-0.01 **	-9.11 **
2	**AP-2**	5.89 **	0.63 **	-0.61 **	0.22 **	-3.49 **	0.14 *	-7.14 **	0.40 **	-0.39 **	-17.46 **	-3.99 **	0.71 **	0.09 **	0.01 **	-3.79 **
3	**AP-4**	-1.22 **	-0.28 **	-0.94 **	0.18 **	1.51 **	-0.07	-2.27 **	0.07 **	0.15 **	0.90	-1.35 **	0.87 **	-0.08 **	0.02 **	-0.33
4	**AP-5**	1.56 **	-1.15 **	0.88 **	0.18 **	-2.27 **	-0.01	4.79 **	-0.15 **	0.15 **	-2.26	0.11	0.02 **	-0.01 **	-0.01 **	14.68 **
5	**KS-602**	-0.89 **	1.18 **	0.35 **	-0.11	-5.04 **	-0.05	-2.27 **	0.21 **	0.49 **	25.14 **	1.33 **	-0.27 **	0.08 **	0.00	-0.37
6	**KS-701**	-2.22 **	1.14 **	-1.01 **	-0.13 *	-0.16	0.40 **	0.62	0.74 **	-0.25 **	-31.97 **	-1.57 **	-0.40 **	0.00	0.00	13.74 **
7	**KS-702**	-5.56 **	-1.28 **	0.59 **	0.09	-3.04 **	0.35 **	6.39 **	-0.64 **	0.12 *	-0.02	-2.82 **	-0.57 **	0.06 **	0.00	-8.44 **
8	**KS-801**	4.00 **	0.85 **	0.57 **	-0.46 **	4.73 **	-0.45 **	1.17 **	-0.33 **	-1.23 **	35.81 **	2.85 **	-1.47 **	-0.03 **	-0.01 **	-4.13 **
9	**KS-802**	0.67 *	0.83 **	-0.23 *	-0.35 **	-2.71 **	-0.01	-3.34 **	0.39 **	-0.59 **	-30.46 **	3.93 **	0.87 **	0.08 **	-0.00 **	4.29 **
10	**KS-221**	-4.22 **	-0.48 **	0.32 **	0.60 **	-0.60	-0.17 **	3.50 **	-0.34 **	0.15 **	-0.64	1.59 **	1.20 **	-0.11 **	0.00	-6.55 **
	Tester															
1	**GS-10**	-1.71 **	-0.01	0.20 **	-0.05	-1.06 **	0.21 **	0.94 **	0.03 **	0.20 **	3.69 **	-0.26 **	0.03 **	-0.06 **	0.00	2.29 **
2	**AP-3**	-0.94 **	-0.50 **	-0.05	-0.06	-0.12	-0.16 **	-1.52 **	-0.03 *	-0.19 **	1.64 *	0.32 **	0.32 **	0.05 **	0.00	-3.14 **
3	**C-18-3**	2.66 **	0.52 **	-0.15 **	0.11 **	1.18 **	-0.05	0.58 *	0.00	0.00	-5.33 **	-0.05	-0.35 **	0.01 **	0.00	0.85
	SE(gca line)	0.269	0.065	0.098	0.065	0.366	0.053	0.404	0.022	0.050	1.394	0.056	0.006	0.002	0.001	1.280
	SE(gca tester)	0.147	0.036	0.054	0.036	0.201	0.029	0.221	0.012	0.028	0.763	0.031	0.003	0.001	0.000	0.701
	SE(bet gca lines)	0.380	0.092	0.139	0.092	0.518	0.075	0.571	0.031	0.071	1.971	0.079	0.009	0.003	0.001	1.810
	SE(bet gca tester)	0.208	0.051	0.076	0.050	0.284	0.041	0.313	0.017	0.039	1.079	0.043	0.005	0.002	0.001	0.992

*, ** significant at 5% and 1% level, respectively

Table 3: Specific combining ability effects.

Sr. No.	Crosses	Days to 50% flowering	Node no. Of first flower	Inter-nodal length(cm.)	No. of primary branches	Days to first picking of pods	Average pod length (cm.)	No. of pods per plant	Average pod weight (g.)	No. of seeds per pod	Plant height (cm.)	Seed shell %	Protein content %	Lysine content (% of protein)	Iron content (mg/100g)	Green pod yield per plant (g.)
1.	AP-1 × GS-10	-2.73 **	-0.85 **	-0.27	0.72 **	2.83 **	0.84 **	-6.18 **	0.67 **	0.80 **	-39.22 **	-3.40 **	0.33 **	-0.04 **	-0.00 *	3.67
2.	AP-2 × GS-10	1.50 **	0.40 **	-0.88 **	-0.34 **	1.23	-0.98 **	6.40 **	-0.38 **	-0.87 **	22.82 **	-1.02 **	0.11 **	0.05 **	0.01 **	2.9
3.	AP-4 × GS-10	1.23 **	0.45 **	1.15 **	-0.38 **	-4.07 **	0.14	-0.22	-0.29 **	0.07	16.40 **	4.42 **	-0.44 **	-0.01 *	-0.00 *	-6.56 **
4.	AP-5 × GS-10	-2.29 **	-0.21	-0.84 **	-0.59 **	0.72	0.65 **	-5.43 **	0.03	0.07	25.40 **	-0.30 **	-2.53 **	-0.11 **	0.01 **	-16.85 **
5.	KS-602 × GS-10	-1.39 **	0.35 **	1.01 **	0.55 **	-9.88 **	-0.05	-0.24	-0.15 **	1.53 **	-9.82 **	-0.85 **	1.52 **	-0.01	0.00 *	-5.22 *
6.	KS-701 × GS-10	3.68 **	-0.14	-0.16	0.04	9.16 **	-0.60 **	5.67 **	0.13 **	-1.60 **	-15.58 **	1.15 **	1.01 **	0.12 **	-0.02 **	22.06 **
7.	KS-702 × GS-10	6.82 **	-0.23 *	-0.58 **	-0.48 **	2.06 **	-0.52 **	6.71 **	0.59 **	-0.73 **	-44.29 **	3.26 **	-0.52 **	0.01 **	-0.03 **	32.09 **
8.	KS-801 × GS-10	-0.94 *	0.32 **	-0.19	0.26 *	4.12 **	0.66 **	-6.97 **	0.44 **	1.39 **	-8.58 **	-2.22 **	-1.02 **	0	0.01 **	-8.88 **
9.	KS-802 × GS-10	-5.88 **	-0.09	0.77 **	0.22	-6.18 **	-0.14	0.27	-1.03 **	-0.67 **	52.86 **	-1.04 **	1.55 **	-0.02 **	0.02 **	-23.21 **
10.	KS-221 × GS-10	4.38 **	-1.23 **	0.07	-0.55 **	-2.17 **	-0.47 **	1.51 *	-0.64 **	0.14	-28.60 **	2.40 **	2.42 **	-0.11 **	0	-18.12 **
11.	AP-1 × AP-3	-2.39 **	0.12	0.99 **	0.46 **	-0.1	0.94 **	-1.17	0.80 **	0.53 **	-29.55 **	2.93 **	-1.03 **	0.08 **	-0.00 **	24.67 **
12.	AP-2 × AP-3	-1.99 **	1.11 **	-1.05 **	0.09	2.27 **	-0.47 **	-0.33	-0.16 **	-0.67 **	58.15 **	-5.33 **	-1.38 **	0.03 **	0	-6.55 **
13.	AP-4 × AP-3	-0.51	0.40 **	2.13 **	0.61 **	3.61 **	-0.80 **	3.51 **	-0.41 **	0.56 **	30.47 **	1.33 **	-1.48 **	-0.11 **	-0.02 **	-1
14.	AP-5 × AP-3	0.39	-1.21 **	-1.61 **	-0.32 **	1.68 **	0.06	7.96 **	-0.53 **	-1.55 **	-1.55	1.92 **	-0.71 **	-0.01 **	0.01 **	10.16 **
15.	KS-602 × AP-3	0.12	0.81 **	-0.52 **	-0.29 *	-5.29 **	0.74 **	-11.47 **	0.94 **	0.99 **	-28.91 **	-3.25 **	2.19 **	0.12 **	0.01 **	-9.16 **
16.	KS-701 × AP-3	-0.84	1.35 **	0.36 *	-0.24 *	-1.28 *	-0.16	-3.52 **	-0.30 **	-1.53 **	-13.76 **	3.04 **	1.01 **	0.02 **	-0.01 **	-11.58 **
17.	KS-702 × AP-3	5.72 **	-2.17 **	-0.26	-0.36 **	3.12 **	0.1	-0.4	-0.07	-0.14	9.02 **	-1.10 **	0.16 **	-0.03 **	0	-1.82
18.	KS-801 × AP-3	-4.88 **	0.82 **	-0.1	0.60 **	-1.84 **	0.07	3.91 **	0.37 **	1.67 **	4.73	-1.93 **	-1.17 **	0.01	0.01 **	13.39 **
19.	KS-802 × AP-3	-0.84	1.37 **	0.29	0.28 *	-1.39 *	0.01	6.37 **	-0.77 **	-1.84 **	54.82 **	-4.30 **	1.00 **	0.12 **	0.02 **	-7.07 **
20.	KS-221 × AP-3	-1.94 **	0.32 **	-0.86 **	-0.52 **	-0.99	-0.12	-9.84 **	0.12 **	1.48 **	-35.00 **	3.33 **	-0.49 **	-0.08 **	0	-12.30 **
21.	AP-1 × C-18-3	2.79 **	-1.69 **	0.57 **	0.24 *	2.38 **	0.11	3.47 **	0.65 **	0.36 **	-19.82 **	0.98 **	-0.51 **	-0.04 **	-0.02 **	19.37 **
22.	AP-2 × C-18-3	1.60 **	-1.30 **	-0.69 **	0.16	-0.5	-0.06	5.00 **	-0.07	-0.48 **	23.93 **	-1.06 **	-0.19 **	0.06 **	0	8.09 **
23.	AP-4 × C-18-3	-3.83 **	0.19	1.43 **	0.1	-3.10 **	0.07	2.58 **	-0.40 **	0.77 **	11.85 **	-2.43 **	-0.11 **	-0.10 **	-0.01 **	-7.82 **
24.	AP-5 × C-18-3	2.23 **	1.11 **	-0.74 **	-0.27 *	3.60 **	-0.01	-7.58 **	0.47 **	-0.29 **	-35.78 **	3.49 **	0.30 **	0.04 **	0.01 **	-0.27
25.	KS-602 × C-18-3	-8.07 **	0.66 **	-0.09	0.05	-7.06 **	0.43 **	-0.96	-0.07	1.87 **	13.00 **	1.45 **	0.85 **	0.09 **	0.02 **	1.4
26.	KS-701 × C-18-3	1.83 **	0.21	-0.04	-0.01	4.34 **	-0.40 **	-0.64	0.27 **	-1.81 **	-14.49 **	-0.06	1.50 **	0.09 **	-0.01 **	-4.37
27.	KS-702 × C-18-3	6.23 **	-0.87 **	0.12	-0.05	2.71 **	-0.03	1.60 *	-0.20 **	-0.07	1.49	-1.39 **	-2.35 **	-0.18 **	-0.00 **	2.97
28.	KS-801 × C-18-3	2.49 **	0.04	-0.38 *	0.03	3.17 **	0.09	-7.00 **	0.98 **	1.14 **	-21.76 **	-2.41 **	-0.88 **	0.07 **	0	9.38 **
29.	KS-802 × C-18-3	1.06 *	1.46 **	0.41 *	0.17	-0.43	-0.28 **	2.32 **	-0.10 **	-1.34 **	55.29 **	-0.49 **	0.08 **	-0.01	0.01 **	2.67
30.	KS-221 × C-18-3	-3.54 **	-1.49 **	-0.03	-0.2	-2.73 **	0.20 *	4.69 **	-0.88 **	0.20 *	-33.54 **	2.91 **	0.80 **	-0.06 **	-0.01 **	-12.05 **
	SE(sca effects)	0.4651	0.1132	0.1696	0.1126	0.6342	0.0922	0.6993	0.0378	0.0871	2.4136	0.097	0.0104	0.004	0.0014	2.217
	SE(bet sca effects)	0.6578	0.1601	0.2399	0.1592	0.8969	0.1303	0.9889	0.0535	0.1232	3.4134	0.1372	0.0148	0.0056	0.002	3.1352

*, ** significant at 5% and 1% level, respectively.

CONCLUSIONS

Form present investigation highly significant variances for both general and specific combining abilities were found for all the characters which indicated that both additive and non-additive gene effects are important. The values of GCA and SCA ratio estimates were observed less than unity for all the studied characters. The conclusion can be framed as information on GCA effects should be supplemented by SCA effects and performance of crosses to predict the transgressive segregants in segregating generations. Seed yield isa quantitative, complex character and due to predominance of non-additive gene action, it would be appreciable to resort to breeding methodologies, such as recurrent selection, biparental mating, and diallel selective mating than to use of backcross techniques or conventional pedigree method.

FUTURE SCOPE

Through the study of combining ability and gene action for pod yield in table pea good general combiners for different characters on the basis of both gca effect and per se performance which may be utilized in multiple crossing programme and the cross combinations which were good both in per se performance and sca effect can be used for improvement of respective characters by getting the transgressive segregants in the advance generations.

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Conflict of Interest. None.

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