EFFECT OF YEAR AND SPACING ON COMBINING ABILITY IN PEA

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Estimates of general and specific combining ability effects and variances are generally obtained from space planted experiments and in most cases are not repeated over years or locations. Little is known of the extent of different genotype x environment interactions and Co what extent they affect the general (GCA) and specific combining ability (SCA) variances. The present investigation was undertaken to provide information on these aspects.

Ten pea varieties and lines (RS-455, Br-52, 'Jof', 'Puget' 'Multipod', 'Extra Rapide', Wav. 01, 'Skinado', Wav. 180045, FJ-111) were crossed in all possible combinations, excluding reciprocals. Parents and F1 progenies were evaluated in two years in space planted experiments (single row plots, rows spaced 1 m apart, 20 cm plant-to-plant spacing), parents, and F2 progenies in one year in a wide (as in F1) and in a narrow spaced experiment (4-row plots, rows spaced 15 cm apart with 10 cm plant-to-plant spacing). Each experiment was arranged in a randomized block design with three replications. Plot means were subjected to analysis of variance and significant interaction variances were analyzed following Griffing's method II (both fixed and random effects models were studied) as detailed by Singh (1).

Analysis of variance for combining ability showed that the mean squares due to GCA, SCA, year effect (in F1), and spacing effect (in F2) were highly significant for all traits. GCA x year and GCA x spacing components of interaction variances were significant for all characters except for seeds per 5 pods. SCA x year was significant only for pods per plant and SCA x spacing only for seeds per 5 pods (Table 1).

Estimates of various genetic parameters and heritabi1ities are shown in Table 2. In accordance with the data of Table 1, estimates of s^2_g and H_n were higher for seeds per 5 pods and 100 seed weight both in F1 and F2.

Due to space limitations, estimates of various effects are not presented here, only correlations between GCA; means of parents and CCA x L are recorded in Table 3. There are significant correlations between GCA vs. means of parents (both in F_1 and F_2) GCA in F_1 vs. GCA in F_2 for each character. In spite of the significant interactions estimates of general combining ability seem unbiased.

1. Singh, D. 1973. Indian J. Genet. 33:469-481

Table 1. Mean squares due to general and specific combining abilities and their interactions with years (A) and spacings (B).

Source	df	Pods per plant	Seeds per 5 pods	100 seed weight	Seed yield
A. F_1 data					
GCA	9	27.57**	291.32**	78.44**	45.10**
SCA	45	5.90**	11.70**	6.96**	9.91**
Year	1	1779.25**	41.29**	158.97**	1915.78**
GCA x year	9	12.29**	1.52	2.97**	24.22**
SCA x year	45	2.08**	0.74	1.66	3.66
Error	216	1.17	2.36	0.92	3.13
B. F_2 data					
GCA	9	5.43**	161.43**	39.85**	10.01**
SCA	45	1.03**	3.84**	1.98**	1.33**
Spacing	1	96.89**	961.17**	651.33**	581.99**
GCA x spacing	9	0.96**	8.14**	7.02**	2.52**
SCA x spacing	45	0.21	2.17*	0.51	1.07
Error	216	0.22	1.45	0.64	0.55

*Significant at P=0.05
**Significant at P=0.01

Table 2. Variance components of general (s_g^2) and specific (s_s^2) combining ability and heritability in narrow (H_n) and broad (H_b) sense.

Traits	s_g^2		s_s^2		H_b		H_n	
	F_1 1/	F_2 2/	F_1	F_2	F_1	F_2	F_1	F_2
Pods per plant	0.47	0.15	1.91	0.20	8.31	24.92	2.83	14.93
Seeds per 5 pods	11.61	5.26	5.48	0.83	92.45	44.94	74.86	41.66
100 seed weight	2.92	1.32	2.65	0.96	84.03	98.73	57.83	72.23
Seed yield	0.65	0.30	2.62	0.13	7.70	5.92	3.05	4.93

1/ Over years
2/ Over spacings

Table 3. Estimates of correlations between effects and/or parental means

	Pods per plant	Seeds per 5 pods	100 seed weight	Seed yield
GCA vs. parental means in F_1	0.75*	0.88**	0.81**	0.93**
GCA vs. GL_1 1/ in F_1	-0.45	-	0.24	0.27
GCA in F_1 vs. GCA in F_2	0.92**	0.96**	0.94**	0.93**
GCA vs. parental means in F_2	0.84**	0.97**	0.91**	0.92**
GCA vs. GL_2 2/ in F_2	0.32	0.08	0.17	-0.12
GL_1 vs. GL_2	-0.63*	-	-0.35	-0.25

1/ GL_1 = GCA x year effects
2/ GL_2 = GCA x spacing effects
* Significant at .05
** Significant at .01

BRANCHING IN PISUM: EFFECT OF THE FLOWERING AND LENGTH GENES

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Several flowering genes are reported to influence branching in peas, Photoperiodic lines have a much greater tendency to produce basal laterals than day neutral lines (1) and this holds whether they initiate flowers at a high or low node. The ability to respond to photoperiod is conferred by genotype Sn Dne (2) and the effect of this gene combination on both flowering and branching is further increased by gene jir (3,10). Compared with Sn Dne stocks, day neutral Pisum stocks of genotype sn Dne or Sn dne reduce outgrowth of basal laterals from photoperiodic Lathyrus odoratus scions (11). The Sn Dne combination also delays the appearance of aerial laterals from the upper nodes in veg plants (8). It is suggested the Sn Dne system may achieve these effects by producing in short days a graft-transmissible substance whose primary role is to direct assimilate flow (4,8,11). contrast, flowering genes Lf-d and veg have a less basic effect. Both result in increased production of aerial laterals (6,8). By delaying (Lf-d) or preventing (veg) flower initiation they increase the number of potential sites for lateral outgrowth and the underlying changes which take place during this delay result in lateral outgrowth. In lf sn segregates seed yield was found to be derived wholly from pods borne on the main shoot while in the latest Lf-d sn segregates yield was derived partially or wholly from pods on lateral branches (6).