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Short Communication

Studies on biparental progenies in garden pea (*Pisum sativum* L.)

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Garden pea (*Pisum sativum* L.) is one of the leading vegetable crops of Himachal Pradesh. The yield potential in this crop has almost become static over the years. The biparental mating approach has, therefore, been followed in the present investigation to assess the pattern of variability in the biparental progenies for its use in improving the pod yield of garden pea.

The biparental progenies (BIP's) were developed in F_2 generations of two intervarietal crosses *viz.*, Arkel × VG 5 (Cross I) and Lincoln × VG 5 (Cross II) using North Carolina Design 1 (NCD 1) as suggested by Comstock and Robinson (1948 and 1952) during *rabi* season (1995-96). The parental varieties *viz.*, Arkel, Lincoln and VG 5 belong to early, medium and late maturity groups, respectively. Designating four F_2 plants as male parents and crossing each of these to four plants selected as females developed the BIP's. The plants used as males and females were chosen at random for the development of BIP's and no seed parent was used in more than one mating. The plants used in making the BIP's were also selfed. Thus, the family consisted of 16 biparental (4 in each male group) and 20 F_3 progenies (4 males and 16 females). The experiment comprised three such sets or a total of 48 BIP's and 60 F_3 families in each cross. The biparental and F_3 progenies were each assigned to single row plot in Randomized Block Design (RBD) with three replications, in two experiments relating to two different crosses. The seeds were sown at a distance of 10 cm in 150 cm rows spaced 45 cm apart at the Vegetable Research Farm, Department of Vegetable Science, Himachal Pradesh Krishi Vishvavidyalaya, Palampur (HP) during *rabi* season (1996-97). The observations were recorded on ten randomly selected competitive plants per plot for eight characters, *viz.*, pod yield (g)/plant, pods/plant, days to 50% flowering, days to first picking, pod length (cm), seeds/pod, shelling (%) and plant height (cm). Although, both self's and BIP's were raised together, separate analysis of variance for each population was carried out.

Biparental progenies when compared with F_3 progenies for their overall mean value (Table 1) revealed that BIP's were, in general, having greater means for most of the characters in both the crosses except days to 50% flowering, days to first picking and shelling (%) in cross II, where the mean values were comparable. Higher mean performance in BIP's was also reported by Singh *et al.*, 1987. It was also of interest to find that the mean performance improved considerably for pod yield/plant in both the crosses in BIP's compared to the F_3 progenies. In addition, high mean yield was also accompanied by early flowering and picking in both crosses, thus indicating the chances of finding transgressive segregants coupled with high yielding ability especially in cross Arkel × VG 5(I).

As regards range in mean values for the various characters (Table 1), it was observed that the lower value of the range was low in F_3 progenies compared to BIP's and the higher value was higher in BIP's compared to F_3 progenies in most of the cases. Besides, it is evident from the range and mean values of BIP's that cross I took lesser days to 50% flowering and first picking compared to that of cross II, which might be attributed to early maturing parent 'Arkel' in cross I.

In the present study, although the phenotypic variances were, in general, higher in the F_3 progenies compared to BIP's for almost all the characters in the two crosses, nevertheless, an increase in the phenotypic variance was observed in BIP's for pod yield/plant and pods/plant in both the crosses and for seeds/pod and plant height in cross I. An increase in the genetic variance of BIP's for pod yield/plant and plant height in cross I and for pods/plant in both the crosses were also found. The phenotypic and genotypic coefficients of variations were greater in F_3 progenies than in BIP's in both the crosses for all the characters except pods/plant in cross II. The estimates of variability, heritability and genetic advance for various

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Table 1. Comparison of range, mean performance and different variances for eight characters between BIPs and F_3 progenies in cross I (Arkel × VG 5) and cross II (Lincoln × VG 5)

Character	Cross	Range		Mean		σ^2p		σ^2g		σ^2e	
		BIPs	F_3	BIPs	F_3	BIPs	F_3	BIPs	F_3	BIPs	F_3
Pod Yield (g)/plant	CI	17-110	11-87	49.6	33.0	371.6	207.4	324.4	187.3	47.3	20.1
	CII	6-46	5-45	21.2	19.1	55.4	51.0	40.4	40.5	14.2	10.4
Pods/plant	CI	5-24	3-19	12.2	8.5	16.3	9.1	13.7	7.9	2.7	1.2
	CII	2-12	2-10	5.6	5.5	3.1	2.6	2.2	2.0	0.9	0.6
Days to 50% flowering	CI	90-120	89-120	106.5	105.8	28.6	44.8	19.6	33.0	9.0	11.8
	CII	102-115	102-117	109.1	110.2	6.6	6.8	1.6	5.2	5.1	1.6
Days to first picking	CI	132-146	128-153	136.9	136.7	13.9	18.3	6.4	7.6	7.5	10.8
	CII	137-145	137-145	138.4	139.4	4.1	7.8	2.8	4.2	1.2	3.6
Pod length (cm)	CI	6-8	6-8	7.1	7.0	0.1	0.1	0.1	0.1	0.1	0.1
	CII	7-8	6-8	7.2	7.1	0.1	0.1	0.1	0.1	0.1	0.1
Seeds/pod	CI	4-7	3-6	5.3	4.8	0.3	0.2	0.2	0.2	0.1	0.1
	CII	5-6	4-6	5.2	4.9	0.1	0.2	0.1	0.1	0.1	0.1
Shelling (%)	CI	39-53	38-54	47.5	46.3	7.6	7.9	3.2	4.1	4.4	3.8
	CII	42-52	41-53	46.8	47.0	4.5	5.4	2.1	3.1	2.2	2.3
Plant height (cm)	CI	28-66	21-60	45.6	39.2	62.8	59.7	55.3	54.7	7.5	5.1
	CII	20-48	19-48	33.7	33.0	24.8	26.1	18.5	21.2	6.2	4.9

Table 2. Comparison of different coefficient of variation, heritability and genetic advance for eight characters between BIPs and F_3 progenies in cross I (Arkel × VG 5) and cross II (Lincoln × VG 5)

Character	Cross	PCV		GCV		ECV		h^2(bs)		GA (% of mean)	
		BIPs	F_3	BIPs	F_3	BIPs	F_3	BIPs	F_3	BIPs	F_3
Pod yield (g)/plant	CI	38.9	43.7	36.3	41.5	13.9	13.6	0.9	0.9	34.7	26.8
	CII	35.1	37.4	29.9	33.4	18.2	16.9	0.7	0.8	11.2	11.7
Pods/plant	CI	33.2	35.6	30.3	33.2	13.4	12.9	0.8	0.9	7.0	5.4
	CII	30.4	29.7	25.6	26.0	16.4	14.5	0.7	0.8	2.6	2.5
Days to 50% flowering	CI	5.1	6.3	4.2	5.4	2.8	3.2	0.7	0.7	7.5	10.1
	CII	2.4	2.4	1.2	2.1	2.1	1.1	0.2	0.8	1.3	4.1
Days to first picking	CI	2.7	3.1	1.8	2.0	2.0	2.4	0.5	0.4	3.5	3.6
	CII	1.5	2.0	1.2	1.5	0.8	1.4	0.7	0.5	2.8	3.1
Pod length (cm)	CI	4.2	4.9	3.2	4.4	2.7	2.1	0.6	0.8	0.4	0.6
	CII	4.5	4.5	2.6	4.0	1.6	2.2	0.7	0.8	0.3	0.5
Seeds/pod	CI	9.7	9.9	7.8	8.9	5.8	4.3	0.6	0.8	0.7	0.8
	CII	7.2	7.9	5.6	6.6	4.5	4.3	0.6	0.7	0.5	0.6
Shelling (%)	CI	5.8	6.1	3.8	4.4	4.4	4.2	0.4	0.5	2.4	3.0
	CII	4.6	5.0	3.1	3.7	3.3	3.3	0.5	0.6	2.0	2.7
Plant height (cm)	CI	17.4	19.7	16.3	18.8	6.0	5.7	0.9	0.9	14.4	14.6
	CII	14.8	15.5	12.8	14.0	7.4	6.7	0.8	0.8	7.7	8.6

characteristics between the BIP's and corresponding F_3 progenies were compared (Table 2) for cross II and I. The heritability estimate of BIP's improved considerably for days to first picking in both the crosses. This is, particularly, of interest to garden pea breeders as it enhances the scope of improved selection response for early maturing types. As is evident from the present study, intermating magnifies the chances of reassembling the maximum number of potentially functional genes and leads to the isolation of stable and widely adapted genotypes.

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