Study of Hybrid vigor (F_1) analysis in vegetable pea (*Pisum sativum* L.)

SUNITA KUSHWAH[1] AND R. N. SHARMA [2]
Department of Horticulture (Vegetable & Fruits), Sabour
Bihar Agricultural College, Sabour, Bhgalpur-813 210, Bihar

ABSTRACT

Considering over all results on economic heterosis, the crosses CHPMR1 x PSM34, CHPMR1 x Arkel and KTP4 x PSM3 should be exploited to breed for stable and widely adopted varieties of vegetable pea. It is expected to give early maturity and powdery mildew resistant lines of pea, combining an optimum plant height, round, bold and lustrous seeds. Segregating population could be handled through pedigree method of breeding.

Keywords: Heterosis breeding, Pea, *Pisum sativum*, line x tester analysis, hybrid varieties

Pea (*Pisum sativum* L.), 2n=14, belongs to the family leguminaceae and grown in plains as well as in hills very successfully. The criteria for the selection of parents for hybridization are one of the most difficult tasks for plant breeder.

Present Address of corresponding author 1. Subject Matter Spacialist, Krishi Vigyan Kendra, Banka, Bihar (India) .

It should not be merely based on genetic analysis and knowledge of combining ability of the potential parents. High degree of heterosis for the seed yield and yield contributing characters in pea has been reported earlier by several workers. Heterosis is used in pea for increasing yield stability Kaur *et al*. (1).

MATERIALS AND MATHODS

The experimental materials for the study of heterosis was planted in experimental plot of the Department of Horticulture (Vegetable & Floriculture), Rajendra Agricultural University, B.A.C., Sabour in randomized block design with three replications during Rabi season of 2002-2004. In the present study 15 hybrids derived from 6 parental lines were examined for yield and other nine characters for economic heterosis. Each genotype was planted in double row of 5-meter length with spacing of 90 cm between rows, 20 cm within row and 10 cm plant to plant. Recommended agronomic practices were followed to raise the good crop. Heterosis over the standard variety i.e. PSM4 were estimated for days to first flowering, days to maturity, plant height (cm), number of primary branches per plant, pod length (cm), number of pods per plant, number of seeds per pod, number of seeds per plant, seed yield per plant (g) and 100 -seed weight (g).

RESULTS AND DISCUSSION

Considering the economic heterosis for seed yield cross CHPMR1 x PSM3 registered maximum yield heterosis of–20.09 to 53.14 percent over the best commercial variety PSM4 (Table1). This cross also exhibited highly positive heterotic effects for other characters like, number of primary branches (69.49), pod length (52.23 cm), number of pods/plant (23.35), number of seeds/pod (27.58) and number of seeds/plant (56.98). The next best cross CHPMR1 x Arkel also registered the high heterotic effects for these characters. In cross KTP4 x PSM3, yield heterosis was associated

with heterotic effects for number of primary branches (69.49), pod length (60.44 cm) and number of seeds/plant (49.18). Another cross FC1 x CHPMR1 also recorded desirable heterotic effects for these traits over standard check variety. Very high degree of heterosis for seed yield was also observed by Kumar *et al*. (1).

Such crosses showing high economic heterosis are expected to yield desirable segregants, which may be handled by pedigree method and suitable varieties may be released. The view earlier supported by Mishra (4).

In our pea breeding programme the importance of CHPMR1 x PSM3, CHPMR1 x Arkel and KTP4 x PSM3 combination has been realized, and a number of out standing early flowering and maturity progenies combining with bold lustrous seeds has been isolated.

Similarly, the positive yield heterosis for cross KTP4 x Arkel was due to high heterotic effects for 100-seed weight (5.54) over standard variety. Therefore, it is suggested that manifestation of heterosis in seed yield was not accompanied by heterosis in all the plant part but can be registered other by single or several components of yield. The view earlier supported by Singh and Mishra (5).

In KTP4 x CHPMR1 and KTP4 x FC1 both the parents were taller and heterotic effects over standard variety for plant height was recorded maximum. Heterosis for plant height in pea has also been reported by Tyagi and Srivastava (6). Similarly, all the hybrids which involved Arkel and PSM3 (early maturing lines) exhibited the maximum negative economic heterosis for days to maturity, suggesting the importance of these lines for breeding as an early maturity.

All the four crosses CHPMR1 x PSM3, CHPMR1 x Arkel, KTP4 x PSM3 and FC1 x CHPMR1 were showed significant negative heterosis for days to first flowering, days

to maturity over the standard variety PSM4. This indicated that all these hybrids showed heterosis for earliness. Kharche and Narsinghani (2), was detected the considerable heterosis over standard variety for days to first flowering and days to maturity. These observations on heterosis for most of the traits are in conformity with the findings of Kaur *et al*. (1).

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Table 1. Heterosis over standard check variety for yield and its component characters in pea (*Pisum sativm* L.)

Character Crosses	Days to first flowering	Days to maturity	Plant height (cm)	Number of primary branches/ plant	Pod length (cm)	Number of pods per plant	Number of seeds per pod	Number of seeds per plant	Seed yield /plant (g)	100 seed weight
KTP4 x FC1	22.54**	13.10**	82.91**	104.66**	40.67**	60.48**	-23.10**	23.08**	17.69**	-4.36**
KTP4 x CHPMR1	21.97**	13.60**	84.27**	77.96**	40.85**	55.19**	-10.34**	38.78**	36.46**	-1.66
KTP4 x PSM4	39.33**	29.62**	-16.38**	55.08**	45.55**	-4.77**	-18.44**	-17.84**	-20.09**	-2.43*
KTP4 x Arkel	20.23**	9.71**	58.34**	61.01**	44.02**	-11.14**	29.82**	15.32	21.67**	5.54**
KTP4 x PSM3	-12.71**	-14.56**	43.32**	69.49**	60.44**	47.23**	0.00	49.18**	50.49**	-3.60**
FC1 x CHPMR1	-12.71**	-16.02**	8.83	84.74**	82.35**	61.79**	0.00	61.37**	41.21**	-12.47**
FC1 x PSM4	23.13**	15.05**	-11.82**	44.06**	55.22**	21.76**	-2.41**	15.28	4.31*	-9.32**
FC1 x Arkel	-12.72**	-16.50**	-12.63**	52.54**	70.33**	-4.49**	-1.93**	-1.36	-8.90**	-7.65**
FC1 x PSM3	18.50**	13.10**	-6.72	-6.77**	53.35**	-7.16**	5.68**	-2.41	1.94	5.40**
CHPMR1 x PSM4	21.97**	14.08**	-13.45**	55.08**	57.27**	23.35**	52.58**	-30.19**	3.11	-0.18
CHPMR1 x Arkel	-12.71**	-16.02**	-11.91**	55.08**	55.59**	47.75**	9.13**	60.83**	53.08**	-4.81**
CHPMR1 x PSM3	-12.72**	-14.56**	-26.11**	69.49**	52.23**	23.35**	27.58**	56.98**	53.14**	-2.43*
PSM4 x Arkel	-18.48**	-18.43**	33.04**	10.16**	55.97**	-35.81**	16.37**	-22.53**	-17.50**	6.57**
PSM4 x PSM3	-22.54**	-20.87**	3.91	-29.66**	55.22**	-19.61**	38.96**	12.54	3.54	4.50**
Arkel x PSM3	-15.60**	-19.41**	-5.54	-21.18**	43.84**	-4.46**	-1.20**	-1.00	1.94	1.80

*Significance at 5% level **Significance at 1% level