Madras Agric. J., 82(3): 171-173 March, 1995
https://doi.org/10.29321/MAJ.10.A00704

COMBINING ABILITY FOR QUALITY TRAITS IN FIELD PEA (*Pisum sativum*)

N.PANDEY
Department of Genetics and Plant Breeding
N.D.University of Agriculture and Technology , Kumarganj, Faizabad 224 229

ABSTRACT

Combining ability based on line x tester analysis for protein, tryptophan, methionine, lysine, ash and total sulphur contents in field pea (*Pisum sativum* L.Poir), showed predominance of non- additive gene action in their inheritance. Among the parents, good general combiners were Batri-Brown for protein and total sulphur and Hans for lysine and ash content. Crosses involving Batri-Brown as one of the female parents had maintained superiority for all these quality traits. For protein content hybrids *viz.*, PRS 2 X T 163, HFP 12 X T 163, 179 X T 163, JP 4 X PG 3, HFP 5 X PG 3 and Batri-Brown X Hans were good specific combiners.

KEY WORDS : Line x tester, Combining Ability, Field Pea

In case of grain legumes, it is not only the yield but quality parameters are also of prime concern for overcoming the protein malnutrition. Keeping this in view, present investigation was undertaken to know nature of gene action for quality traits of field pea *Pisum sativum* L.Poir. in deciding an effective breeding programme.

MATERIALS AND METHODS

Line X tester mating design consisting of 42 F_1 hybrids of 14 lines and 3 testers was used for this study. Materials were raised at N.D. University of Agriculture and Technology, Kumarganj. Faizabad during 1983-84. Observations on six quality parameters *viz.*, protein, tryptophan, methionine, lysine, ash and total sulphur content were determined through biochemical analyses and the data were subjected to combining ability analysis as per standard statistical procedures.

RESULTS AND DISCUSSION

Highly significant differences were observed among the treatments for all the characters. Variances, due to crosses for these traits also exhibited wide genetic variability. Variances in respect to general and specific combining ability were found to be highly significant for all the traits except methionine content (Table 1). Batri-Brown was a good general combiner for all traits except for ash content as it showed average combining ability (Table 2). For protein, P 185, P 9, PRS 11, 179 and HFP 6: JP 4, 179 and HFS 5 for tryptophan; PRS 15, HFP 12, P 388, JP 4 and Hans for lysine; JP 4 and T 136 for methionine; PRS 4, P 388, PG 3 and Hans for ash content and for total sulphur JP 4 and T 163 revealed higher proportion of favourable genes for each variable respectively. Similar findings have been reported earlier (Sharma *et al.*, 1976)

On the basis of specific combining ability effects (Table 3) PRS 8 x T 163, 179 x T 163, Batri-Brown x Hans, PRS 4 x Hans and HFP 6 x PG 3; HFP 5 X T 163 and HFP 5 x PG 3 ; and HFP 12 x T 163, P 388 x T 163, PRS 4 x T 163 and HFP 12 x Hans; P 388 x PG 3; P 185 x T 163, P 9 x T 163, PRS 8 x T 163; PRS 4 x PG 3 and HFP 5 x T

Table 1. Analysis of variance for combining ability and components of variance, ratio ($\sigma^2 g / \sigma^2 s$) and degree of dominance ($\sigma^2 s / \sigma^2 g$) 0.5

Source	df	Protein	Typtophan	Lysine	Methionine	Ash	Total Sulphur
Males	2	0.050	0.003**	5.244**	0.255**	1.397**	0.002**
Females	13	4.589**	0.011**	0.062	0.002*	0.003**	0.003**
Males x Females	26	2.756**	0.002**	0.136**	0.001	0.003**	0.0004**
Error	41	0.063	0.0003	0.086	0.0012	0.0006	0.0002
$\sigma^2 g$		0.017	0.0002	0.099	0.005	0.027	0.0003
$\sigma^2 s$		0.897	0.0005	0.0053	0.0002	0.0006	0.0009
$(\sigma^2 g / \sigma^2 s)$		0.019	0.366	18.623	23.810	44.194	0.326
$(\sigma^2 s / \sigma^2 g)$		7.264	1.654	0.232	0.205	0.151	1.759

* Significant at 5% level and ** Significant at 1% level.

Table 2. Mean and GCA performance of the parents for quality traits in field pea

	Protein (X_1)	Typtophan (X_2)	Lysine (X_3)	Methionine (X_4)	Ash (X_5)	Sulphur (X_6)
Rachna	VP (22.63)	CP (1.05)	P (6.12)	P (0.64)	A (2.53)	P (0.27)
PRS 8	VP (23.87)	VP (1.05)	P (6.63)	A (0.49)	VP (2.77)	P (0.26)
PRS 4	A (21.34)	P (1.06)	A (7.12)	P (0.58)	G (2.89)	P (0.27)
P 185	G (23.84)	VP (1.10)	VP (7.15)	P (0.50)	A (2.77)	A (0.26)
P 9	G (22.74)	VP (1.04)	VP (6.42)	P (0.59)	VP (2.53)	P (0.28)
PRS 15	VP (24.05)	VP (1.05)	G (6.42)	P (0.59)	A (2.58)	A (0.28)
HFP 12	A (20.93)	P (1.04)	VG (6.67)	P (0.63)	A (2.47)	A (0.29)
P 388	A (23.34)	VP (1.03)	G (6.79)	P (0.61)	G (2.56)	P (0.28)
PRS 11	G (21.14)	VP (1.05)	VP (7.11)	P (0.49)	VP (2.75)	A (0.25)
Batri-Brown	VG (22.17)	G (1.05)	VG (7.22)	VG (0.68)	A (2.63)	G (0.29)
JP 4	VP (29.90)	G (1.07)	G (6.75)	G (0.65)	A (2.65)	G (0.29)
179	G (20.57)	G (1.04)	P (6.58)	A (0.64)	A (2.58)	P (0.28)
HFP 5	A (23.50)	G (1.08)	A (6.63)	P (0.50)	P (2.63)	P (0.26)
HFP 6	G (22.54)	P (1.06)	VP (6.80)	P (0.56)	P (2.55)	P (0.27)
T 163	A (23.08)	P (1.04)	P (7.12)	VG (0.54)	VP (2.70)	G (0.28)
PG 3	A (24.08)	A (1.12)	P (7.23)	VP (0.64)	G (2.86)	VP (0.29)
Hans	P (23.55)	A (1.10)	G (7.20)	A (0.63)	VG (2.77)	A (0.28)

VG = Very good means significant at 1%
G = Good and significant at 5%
VP = Very poor, had negative value and significant at 1%
P = Poor, negative value and 5% significant
A = Non-Significant positive value

163; and HFP 12 x PG 3; Rachna x PG 3 and PRS 8 x PG 3 were good specific combiner for protein, tryptophan, lysine, methionine, ash and total sulphur content, respectively. None of the crosses exhibited high sca effect for all the traits under study, whereas the crosses PRS 8 x T 163 and HFP

Table 3. Ranking of desirable cross combinations for sca effects and mean performance for six characters in field pea

Characters	Cross combinations	sca effects	Mean values	SE ±
Protein	PRS 8 x T 163	1.617**	21.23	0.147
	PRS 4 x Hans	1.430**	23.23	
	179 x T 163	1.141**	23.70	
	Batri-Brown x Hans	1.117**	24.25	
	HFP 6 x PG 3	1.007**	23.61	
Typtophan	HFP 5 x T 163	0.331**	1.04	0.010
	HFP 5 x PG 3	0.110**	1.25	
Lysine	P 388 x T 163	0.163**	6.27	0.047
	HFP 12 x T 163	0.149**	6.74	
	PRS 4 x T 163	0.114**	6.62	
	HFP 12 x Hans	0.101**	7.24	
Methionine	P 388 x PG 3	0.035*	0.463	0.014
Ash	P 185 x T 163	0.272**	2.52	0.014
	P 9 x T 163	0.043**	2.45	
	PRS 8 x T 163	0.033*	2.41	
	PRS 4 x PG 3	0.034*	2.72	
	HFP 5 x T 163	0.038*	2.45	
Total sulphur	HFP 12 x PG 3	0.009*	0.252	0.004
	Rachna x PG 3	0.009*	0.260	
	PRS 8 x PG 3	0.008*	0.250	

* Significant at 5% level; ** Significant at 1% level.

5 x T 163 exhibited good specific combining ability for two traits *viz.*, protein and ash content and tryptophan and ash content respectively. Similar observations have been recorded in respect to protein and other components (Chauhan *et al.*, 1988; Gupta *et al.*, 1982).

The specific combiners for protein content involved high x average, high x low, low x average and low x low general combining ability. The general combining ability variances were higher than specific combining ability variances for protein, methionine, ash and total sulphur and vice-versa in respect to tyrptophan and lysine contents indicating predominance of additive and non- additive gene effects, respectively in the expression of these variables.

The results revealed that both additive and non-additive genetic variances were important in the inheritance of quality traits in pea. Therefore, conventional methods of breeding which capitalise mainly on the additive genetic variance may not hold good in improving these characters. Some alternate methods like biparental mating in early generations may be more effective for selection of these characters.

REFERENCES

CHAUHAN, Y.S., GHOSH, J.P., SINGH, H.G. and KATIYAR, R.P. (1983). Genetics of some quality traits in pea. **International Congress of Genetics, New Delhi, India Abstr., 937.**

GUPTA, K.R. DAHIYA, B.S., PAPLI, S. DHILLON, S. and DHINDSA, K.S.(1982). Genetics of tryptophan and methionine content in pea. **Indian J. Agric. Sci., 52:448 - 451.**

SHARMA, R.P. NANDPURI, K.S. and KUMAR, J.C. (1976). Diallel analysis of protein and ascorbic acid contents in pea. **Indian J. Hort., 33:** 182 - 186.

Madras Agric. J., 82(3): 173-175 March, 1995

TIME OF PLANTING STUDIES IN SUNFLOWER HYBRIDS

A.NANDHAGOPAL, K.S.SUBRAMANIAN and A.GOPALAN

Agricultural Research Station, Tamil Nadu Agricultural University, Bhavanisagar 638 451.

ABSTRACT

Field experiment was conducted to study the response of sunflower hybrids *Viz.*, BSH-1 and MSFH 17 in different dates of sowing during summer and *Kharif* seasons of 1991-93 at the Agricultural Research Station, Bhavanisagar. The results revealed that with the hybrid MSFH 17, early June and Mid December plantings gave higher seed yield, head diameter, seed filling, hundred seed weight and oil content.

KEY WORDS: Sunflower, planting Time

Sunflower *(Helianthus annuus* L.), being a photo insensitive crop, could be sown alround the year and can find a place in existing cropping pattern. But cultivars differ in their response to varying seeding dates even in a given season. Seasonal factors play a major role in the growth and yield of sunflower (Yadav and Vikrem Singh, 1976). The knowledge on its crop husbandry particularly in hybrids has not attained such a level as that of other oil seed crops commonly grown. For any crop, the optimum time of sowing has to be worked out in order to obtain higher yields. A study was therefore carried out to find out the optimum time of sowing in different seasons for getting maximum yields in sunflower hybrids.

MATERIALS AND METHODS

Field experiments were conducted to study the response of sunflower hybrids in different dates of sowing during summer and *Kharif* seasons of 1991-93 at the Agricultural Research Station, Bhavanisagar. The experimental soil belongs to Alfisol, sandy loam in texture, neutral p^H, free from soluble salt and low fertility status in available nitrogen (182 kg/ha), low in available phosphorous (9.6 kg/ha) and medium in available potassium (216 kg/ha).

Treatments consisted of two hybrids *Viz.*, BSH 1 and MSFH 17 and four times of sowing in summer starting from December 15 at fortnightly intervals upto February 1 and during *Kharif* from