Electronic Journal of Plant Breeding, 7(4): 1151-1154 (December 2016)
ISSN 0975-928X
DOI: 10.5958/0975-928X.2016.00160.5

Research Note

Heterosis for yield and yield components in sesame (*Sesamum indicum* L.)

R.M. Patel*[1], R.M. Chauhan[2] and J.A. Patel[3]
[1]Polytechnic in Agriculture,S D A U,Khedbrahma,Gujarat
[2]Department of Seed Technology,S D A U,Sardarkrushinagar, Gujarat
[3]Agricultural Research Station,S D A U, Talod, Gujarat
E-mail: rmpatel106@gmail.com

(Received: 15 March 2016; Accepted: 16 Dec 2016)

Abstract
Heterosis for days to flowering,days to maturity, plant height, number of primary branches per plant, number of capsules per plant, number of seeds per capsule,chlorophyll content,oil per cent,protein per cent and single plant yield were evaluated in 36 crosses derived from a 9 x 9 diallel mating design in sesame. Heterosis was worked out over midparent and better parent.Combinations Priya X Vianyak, PBTil-1 X TMV-6 and TC-25 X Vinayak showed a highly significant relative heterosis and heterobeltiosis for single plant yield and some of its yield components and hence could be exploited for developing superior varieties.

Key words
Sesame, heterosis, economic traits

Sesame (*Sesamum indicum* L.) is one of the most ancient and important oilseed crops and its seed contains 50 % oil and 25 % protein. It is sixth most important oil seed crop in India and has 19.01 lakh ha area with 8.10 lakh tones production and productivity of 426 kg/ha. The yield improvement achieved through conventional hybridization followed by selection has been only marginal. Although sesame is largely a self-pollinated crop, high level of heterosis for yield and its components has been reported by Fatteh *et al*. (1995), Padmavathi, (1998), Jadhav and Mohrir, (2013). But, the commercial exploitation of this phenomenon is feasible only if the means of producing hybrid seeds economically could be made available. Further, with convincing reports on availability of heterosis and possibility of commercial hybrids, generation of cytoplasmic male sterility system in sesame using the possible wild donors can enable the production of hybrids. The sesame plant has distinct features favourable for hybrid seed production. Heterosis of small amount for individual yield contributing characters may have an additive or synergistic effect on the end product (Sasikumar and Sardana, 1990). Therefore, the present study was undertaken to study the extent of heterosis for quantitative traits in sesame.

Nine morphological diverse sesame genotypes, representing different sesame growing regions of India, namely GT-2 and GT-10 from Gujarat, T-78 from U.P, TKG-22 from M.P., PB Til -1 from Panjab, Priya from W B, Vinayak from Orissa and TMV-6 from T.N., were crosses in a half diallel mating system in 9 x 9 diallel mating design during *kharif* -2011 The resulting 36 F_1 hybrids along with their parents were grown in three environments in three consucutive seasons *viz*, *kharif*-12, *semi rabi*-12 and *summer*-13 at Regional Oilseeds Research Station, S. D. Agricultural University, Talod, Dist:Sabarkantha (Gujarat) following a randomised block design with three replications. The parents were raised in rows of 5 m in length following a spacing of 60 cm between row and 15 cm between plants. Observations on randomly selected five plants from each replication in each season were recorded for days to flowering,days to maturity, plant height, number of primary branches per plant, number of capsules per plant, number of seeds per capsule,chlorophyll content,oil per cent,protein per cent and single plant yield. For all the characters, relative heterosis, heterobeltiosis and standars heterosis were estimated following Fonesca and Patterson (1968).

Heterosis was calculated as per cent increase or decrease over midparent, corresponding better parent and standard checks GT-10 and TKG-22.The present study furnishes information on varibility of genotypes for chlorophyll content and seed yield. Chlorophyll content index indicates total chlorophyll content in plants. The rate of photosynthesis is directly propotional to the chlorophyll content. The cross T-78 x TC-25 exhibited high significant positive heterosis in chlorophyll content, evan though not registered for high seed yield. This indicates chlorophyll content is not dorectly effects on seed yield. The relation of the photosynthetic capacity and crop yield is complex.The range of heterosis and number of crosses showing a desirable heterotic response for the characters studied are presented in Table 1. Table 2 shows the top three crosses with the highest relative heterosis and heterobeltiosis for all the characters studied.

In the present study one crosse *viz*., TKG-22 X GT-10 exhibited a significant negative heterosis for plant height. One cross *viz*, Vinayak X TMV-6 exhibited a significant positive heterosis for

 DOI: 10.5958/0975-928X.2016.00160.5

number of branches per plant. Similar results were reported by Alam *et al.* (1999). Twenty and fiften crosses exhibited significant standars negative heterosis over check GT-10 for days to flowering and plant height respectively. Priya X Vinayak, PBTil-1 X TMV-6 and Vinayak X TMV-6. exhibited significant positive heterosis and heterobeltosis for number of capsules per plant. Similar results were reported by Govindrasu *et al.(*2001) For the number of seeds per capsule, one crosse *viz*, GT-2 X TKG-22 recorded significant positive heterosis and heterobeltiosis. Two and four crosses exhibited positive significant standard heterosis over check GT-10 and TKG-22 respectively. For harvest index, one cross viz, GT-2 x T-78 recorded significant positive heterosis and heterobeltiosis. Seven and five crosses exhibited positive significant standard heterosis over check GT-10 and TKG-22 respectively. One cross *viz*, T-78 x TC-25 exhibited a significant positive heterosis for chlorophyll content. For oil per cent, two crosses *viz*, Priya x TMV-6 and T-78 x TC-25 reported significant and positive low heterotic values on all the three bases. Low heterosis for oil content was reported by Navadiya *et al.* (1995). Two and twenty two crosses exhibited significant positive standard heterosis over check GT-10 and TKG-22 respectively for oil percent. For protein percent, twenty two and two crosses exhibited significant positive standars heterosis over check GT-10 and TKG-22 respectively. Significant and positive heterotic values for single plant yield on all the three bases were found in ten crosses *viz.*, Priya x Vinayak, PBTil-1 x TMV-6, Priya x GT-10, TC-25 x Vinayak, Vinayak x TMV-6, PBTil-1 x GT-10, GT-2 x Priya, TC-25 x GT-10, TMV-6 x GT-10 and GT-2 x TC-25. A total eighteen crosses exhibited sinificant positive standard heterosis over check GT-10 for seed yield per plant. Similar results were reported by Padmavathi (1998).

The crosses Priya x Vinayak and PBTil-1 x TMV-6 had a high heterotic vigour for two traits *viz*, number of capsules per plant and single plant yield. The crosses T-78 x PBTil-1 had high heterotic vigour for two traits *viz*,test weight and protein content The high heterotic crosses can be utilized for developing superior hybrids.

References

Alam, S., Biswas, A.K. and Mandal, A.B. 1999. Heterosis in sesame (*Sesamum indicum* L.). *J. Inter. Academicia.*, **3**(2):134-139.

Banerjee, P.P. and Kole, P.C. 2010. Heterosis, inbreeding depression and their relationship with genetic divergence in sesame (*Sesamum indicum* L.). *Acta Agronomica Hungarica*, **58**(3): 313-321.

Fateh, U.G., Patel, N.A., Chaudhari, F.P., Dangariya, C.J. and Patel, P.G. 1995. Heterosis and combining ability in sesame (*Sesamum indicum L.*). *J. Oilseeds Res.*, **12**(2): 184-190.

Fonsca, S. and Patterson, F.L. 1968 Hybrid vigour in seven parent diallel cross in Winter wheat (*Triticum astivum*). *Crop Sci.*, **2**: 85-88

Govindrasu *et al.* (2001) Heterotic expresion in sesame (*Sesamum indicum L.*) *Madras Agricultural J.* **86**(7-9): 479-481

Jadhav, R.S. and Mohrir, M.N. 2013. Heterosis studies for quantitative traits in sesame (S*esamum indicum* L.). *Electron. J. Plant Breed.*, **4**(1): 1056-1060.

Khan, M.A., Mirza, M.Y., Akmal, M., Abdul Rashid, Mohmand, A.S., Nawaz, M.S., Nazakat Nawaz and Yousuf, M. 2009. Study of heterosis in ten crosses of sesame (*Sesamum indicum* L.). *Pakistan J. Agric. Res*., **22**(3-4): 127-131.

Krishnaiah, G., Reddy, K.R., Reddy, G.L.K. and Reddy, S. 2002. Identification of superior heterotic crosses for yield and yield components in sesame (*Sesamum indicum L.*). *Crop Res.*, **24**(1): 72-76.

Mishra, A.K., Raghu, J.S., Ghurayya, R.S., Ali, S.A. and Raghuwanshi, R.S. 1995. Variability and association in multi-capsule type sesame. *Crop. Res*., **9**(2):317-322.

Navadiya, L.J., Godhani, P.R. and Fougat, R.S. 1995. Heterosis studies in sesame (*Sesamum indicum* L.). *Gujarat Agrl. Univ. Res. J*., **20**(2):73-77.

Padmavathi, N. 1998. Heterosis potential of sesame (*Sesamum indicum L.*) crosses in F1 and F2 generations. *Indian J. Agric. Sci*., **68**(11): 750-751.

Sasikumar, B. and Sardana, S. 1990. Heterosis for yield and yield components in sesame (*Sesamum indicum L.*). *Indian J. Genet.*, **50**(1): 45-49.

Singh, A.K., Lal, J.P. and Kumar, H. 2005. Identification of certain heterotic crosses for their exploitation in the improvement of sesame (*Sesamum indicum L.*). *Sesame and Safflower Newsl.*, **20**: 34-37.

Thiyagu, K., Kandasamy, G., Manivannan, N. and Muralidharan, V. 2007. Studies on heterosis in genetically diverse lines of cultivated sesame (*Sesamum indicum* L.). *Madras Agric. J*., **94**(7): 162-167.

Electronic Journal of Plant Breeding, 7(4): 1151-1154 (December 2016)
ISSN 0975-928X
DOI: 10.5958/0975-928X.2016.00160.5

Table 1. Number of crosses showing desirable heterotic performance and range of heterosis for yield and yield components

Characters	Mean value	Range of heterosis (%)		Number of crosses with desirable heterosis	
		Relative heterosis (%)	Heterobeltiosis (%)	Relative heterosis (%)	Heterobeltiosis (%)
Days to flowering	41.95	-8.17 to 11.75	-5.21 to 30.37	0	0
Days to maturity	100.10	1.30 to 15.31	4.19 to 23.10	0	0
Plant height	109.63	-7.88 to 11.22	-0.77 to 19.25	1	0
Number of primary branches per plant	4.23	-28.26 to 24.32	-34.00 to 16.67	1	0
Number of capsule per plant	61.56	-25.27 to 37.25	-33.29 to 33.80	8	4
Number of seeds per capsule	65.48	-15.32 to 17.25	-20.06 to 15.51	4	1
1000 seed weight(g)	3.62	-20.05 to 29.95	-22.55 to 25.53	5	2
Harvest index (%)	32.03	-41.75 to 38.83	-42.85 to 14.59	7	3
Chlorophyll content(cci)	23.13	-42.94 to 22.65	-53.33 to 14.23	1	1
Oil content (%)	43.55	-8.97 to 14.76	-11.21 to 12.14	4	2
Protein content (%)	24.29	-15.57 to 31.13	-27.95 to 28.83	9	3
Seed yield per plant (g)	11.96	-41.70 to 80.31	-53.77 to 68.89	16	10

 DOI: 10.5958/0975-928X.2016.00160.5

Table 2. Best three crosses showing high heterotic vigour for yield and yield components

Character	Relative heterosis	Heterobeltiosis
Days to flowering	-	-
Days ro maturity	-	-
Plant height(cm)	TKG-22 x GT-10	-
Number of primary branches per plant	VINAYAK X TMV-6	-
Number of capsules per plant	PRIYA X VINAYAK	PRIYA X VINAYAK
	PBTil-1 X TMV-6	PBTil-1 X TMV-6
	VINAYAK X TMV-6	VINAYAK X TMV-6
Number of seeds per capsule	GT-2 X TKG-22	GT-2 X TKG-22
	PBTil-1 X PRIYA	-
	T-78 X GT-10	-
Harvest index(%)	TKG-22 X VINAYAK	GT-2 X T-78
	T-78 X TKG-22	GT-2 X TC-25
	GT-2 X T-78	GT-2 X TKG-22
1000 seed weight(g)	T-78 X PBTil-1	T-78 X PBTil-1
	GT-2 X PBTil-1	GT-2 X PBTil-1
	T-78 X GT-10	-
Chlorophyll content(cci)	T-78 X TC-25	T-78 X TC-25
	TKG-22 X PBTil-1	-
	-	-
Oil content(%)	PRIYA X TMV-6	PRIYA X TMV-6
	T-78 X TC-25	T-78 X TC-25
	PBTil-1 X TMV-6	-
Protein content(%)	T-78 X PBTil-1	PBTil-1 X VINAYAK
	PBTil-1 X VINAYAK	T-78 X PRIYA
	T-78 X PRIYA	T-78 X PBTil-1
Seed yield per plant(g)	PRIYA x VINAYAK	PRIYA x VINAYAK
	PBTil-1 x TMV-6	PBTil-1 x TMV-6
	PRIYA x GT-10	TKG-22 x TC-25