Madras Agric. J. 77. (9-12): 517-519 (1990) https://doi.org/10.29321/MAJ.10.A02012

HETEROSIS IN VARIETAL CROSSES OF SUNFLOWER

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ABSTRACT

Desirable significant negative heterosis over mid parent was observed for days to 50 percent flowering and maturity almost in all the cross combinations involving the parent EC 69874. Significant and positive hetrerosis for plant height, head diameter, number of leaves, 100 seed weight and harvest index was also evident in most of the crosses. Heterosis was of low magnitude in case of head diameter and negative in direction for oil content. Heterosis over mid parent for seed yield per plant ranged from 17.4 to 102.7% and the cross Kanpur Selection X Co 1 recorded the highest value. The crosses EC 100101 x K 2, K 74xCo1, K 74xK 1 and EC. 68415xCo 1 recorded significant positive heterosis for seed yield and most of the yield components. Significant and positive heterosis over mid parent for oil content was noticed in the hybrids of EC 93617 x Co 1 and EC 22237 x Co 1.

KEY WORDS : Sunflower, Heterosis

Sunflower, as a source of edible oil for human consumption, offers scope for commercial exploitation of heterosis. The studies on the extent and nature of heterosis will be helpful in any breeding programme to identify high yielding hybrid cultivars. The present investigation was undertaken to study the heterosis in selected cross combinations involving genetically diverse parents.

MATERIALS AND METHODS

The experiment involved 12 lines of different geographical origin as female and 3 testers of well adapted improved varieties (K 1, K 2 and Co 1) as male parents. Seeds from 36 hybrids along with their parents were raised in replicated randomised blocks design with 15 plants per row adopting a spacing of 60 x 30 cm. The crop was raised during November 1985 at the Agricultural Research Station, Kovilpatti and observations were recorded. On randomly selected five plants in each replication. Three composite seed samples were drawn from the observed plants in each of 36 Fls and 15 parents and the oil content of all the samples was determined using NMR spectrometer available at the University of Agricultural Sciences, Bangalore.

Heterosis was estimated for all the characters as percentage increase or decrease in F1 generation over the mid and better parents.

RESULTS AND DISCUSSION

The analysis of variance showed significant differences among the hybrids for all the characters studied except seed yield per plant (Table 1). The percentage of increase in F1 generation over better parent revealed varying degrees of heterosis for different traits (Table 2).

Ten hybrids recorded significant and negative heterosis over mid parent for earliness in flowering. The parents EC 102249 and EC 69874 recorded significant negative heterosis in combination with all the tester parents proving their ability to induce earliness. Only one hybrid EC 69874 x K1 has recorded highly significant and negative heterosis both over mid - parent and better parent indicating the over dominance for earliness.

Four hybrids recorded significant and negative heterosis over mid parent for days

Table 1. Analysis of variance for yield components in sunflower

Source of variation	df	Mean squares								
		Days to 50% flowering	Days to maturity	Plant height	Head dia meter	Number of Leaves	100 seed weight	Harvest index	Seed yield per plant	Oil content
Replication	2	12.1	3.1	2377.4	12.8	129.8	1.1	130.8	807.9	13.4
Hybrids	35	51.5**	39.1**	1165.9**	8.2**	18.5**	1.5**	68.8**	97.7^{NS}	19.8*
Female	11	63.7**	27.9**	1440.3**	7.6**	21.9**	3.2**	87.9**	81.3^{NS}	19.6^{NS}
Male	2	462.2**	438.0**	9073.7**	71.4**	167.5**	0.9^{NS}	357.2**	617.9**	55.0*
Female x Male	22	8.0*	8.5**	309.9^{NS}	2.8^{NS}	3.3^{NS}	0.7^{NS}	33.0^{NS}	49.0^{NS}	16.7^{NS}
Error	100	4.8	2.6	209.2	2.9	5.5	0.5	20.4	65.8	11.2

* Significant at 5% level ** Significant at 1% level

to maturity. The hybrid EC 69874 x K 1 alone recorded highly significant and negative heterosis over better parent for this trait.

Heterosis over mid parent and better parent for plant height showed two distinct trends. Almost 50% of the F1 hybrids exhibited positive heterosis over mid parent while the rest showed negative trend. Among them, six hybrids recorded significant and positive heterosis, while three hybrids recorded significant and negative heterosis. Heterosis on the basis of better parent (taller) was found to be negative almost in 75% of F1 hybrids. In most of the hybrid combinations involving Co1 as one of the parents, heterobeltiosis was found to be highly significant and negative providing scope for developing short statured hybrids in sunflower.

The extent of heterosis for head diameter was found to be low. None of the hybrids recorded significant and positive heterosis over better parent. Only one hybrid, K 74 x K 1 recorded significant and positive heterosis over mid parent and highest degree of positive heterosis over better parent. Positive heterosis over better parent for this trait was also reported by Chaudhary and Anand (1984). They emphasised the need for the maximum weightage of head diameter in improving the seed yield in sunflower.

Number of leaves is claimed to be one of the components for high yield in sunflower (Ayyaswamy, 1978). Almost 50 per cent of F1 hybrids exhibited negative heterosis when compared with their respective better parents. Only one hybrid, EC 22237 x K 1 recorded significant and positive heterosis both over mid parent and better parent for this trait.

In most of the cases significant positive heterosis was observed for 100 seed weight. Nineteen hybrids recorded significant and positive heterosis over mid parent and six hybrids recorded significant and positive heterosis over better parent. Only in the combination K 74 x Co 1 the two levels of heterosis were found to be very high as well as positively significant.

The extent of heterosis for harvest index was high. Twenty eight hybrids recorded significant and positive heterosis over mid parent, while 14 hybrids recorded significant positive heterobeltiosis. Highest degree of heterosis was observed in two hybrid combinations, EC 102249 x Co 1 and K 74 x Co 1 with the two levels of heterosis being highly significant and positive.

Heterosis over mid parent for seed yield per plant ranged from - 17.4% to 102.7%. Out of 36 hybrids, 21 exhibited significant positive heterosis. The highest value of heterosis was observed in the hybrids

Table 2. Mean performance of heterosis (in percentage) over better parent (BP) for different traits in sunflower

Crosses	Days to 50% flowering	Days to maturity	Plant height	Head dia meter	Number of Leaves	100 seed weight	Harvest index	Seed yield per plant	Oil content
EC 85820 x K 1	1.4	0.9	-10.5	-17.4*	7.7	2.9	20.5	-2.6	-0.5
EC 85820 x K 2	3.2	8.1**	1.2	-12.0	-9.8	-2.8	18.7	13.2	-14.5*
EC 85820 x Co 1	5.1	17.6**	-6.5	-8.3	-7.3	19.1*	5.0	2.5	-5.9
EC 75272 x K 1	-3.4	3.6	3.3	-1.2	-5.6	0.0	32.7*	34.0	-15.6*
EC 75272 x K 2	6.6	8.7**	2.9	-5.2	-19.5**	-2.8	14.7	25.8	-2.0
EC 75272 x Co1	10.4	23.6**	-16.5*	-23.2*	-23.1**	6.1	69.8**	2.8	4.5
EC 102249 x K 1	-5.9	1.9	13.7*	-10.9	3.8	33.3**	19.6	3.7	-7.1
EC 102249 x K 2	0.0	10.5**	-15.5**	-14.5	-3.1	19.7*	27.0*	6.2	-1.8
EC 102249 x Co 1	5.1	15.6**	-31.1*	-26.7**	-12.3	26.9**	59.6**	-14.2	-3.1
EC 68415 x K 1	10.9**	6.4**	2.9	-0.6	4.6	13.0	-8.5	26.6	-1.6
EC 68415 X K 2	6.9	10.9**	0.2	4.7	2.5	4.2	10.8	10.5	0.5
EC 68415 X Co 1	8.9*	18.6**	-8.0	-13.6	5.9	10.6	17.0	-4.5	3.5
EC 100101 X K 1	0.0	6.6**	-2.9	2.5	1.4	-2.9	15.2	18.6	-4.9
EC 100101 X K 2	8.0*	11.4**	-0.1	-2.0	7.2	2.8	15.7	37.2	-4.6
EC 100101 X Co 1	6.7	18.6**	-8.3	-12.6	-6.3	12.1	37.7**	22.5	8.9
K 74 X K 1	2.7	1.5	-1.2	8.6	-3.7	11.6	5.1	29.8	0.3
K 74 X K 2	11.3**	12.8**	-14.6*	-12.1	-6.9	5.6	-7.0	29.6	-9.4
K 74 X Co 1	12.7**	19.7**	-22.2**	-16.7*	-8.7	37.9**	74.9**	29.1	0.3
EC 69874 X K 1	-12.6**	-5.5**	-29.4**	-25.7**	-13.9*	-1.4	32.2*	-23.3	1.1
EC 69874 X K 2	3.2	7.7**	-30.2**	-24.6**	-17.2**	-2.8	36.0**	-10.0	0.5
EC 69874 X Co 1	10.4	17.1**	-32.0**	-27.5**	-20.2**	7.6	25.2	-27.6	5.7
EC 93617 X K 1	0.6	3.7	-5.9	0.0	1.7	18.8*	27.2	29.5	-13.3*
EC 93617 X K 2	5.2	8.1**	-0.8	-5.7	0.7	12.7	-4.3	9.5	-8.2
EC 93617 X Co 1	11.1**	17.6**	-5.1	-13.8	-4.4	15.1	40.1**	11.2	4.4
Sunraj X K 1	-0.7	1.9	-5.9	-4.3	1.9	-5.8	39.2*	25.8	6.3
Sunraj X K 2	10.1**	9.5**	-13.8*	-7.4	-7.2	1.4	1.7	21.6	0.5
Sunraj X Co 1	16.2**	21.7**	-34.4**	-27.0**	-13.1*	4.5	69.3**	-22.4	-4.9
Morden x K 1	6.1	13.8**	1.2	5.0	-3.1	1.4	14.7	16.7	-5.5
Morden x K 2	6.0	9.5**	-5.5	1.3	0.0	20.0**	11.7	32.3	-4.3
Morden x Co 1	6.7	17.1**	-22.9**	-26.2**	-14.1*	3.2	60.7**	-2.0	4.4
Kanpur selection x K 1	7.3*	3.0	-1.3	0.6	4.2	0.0	13.3	9.4	-12.6
Kanpur selection x K 2	9.2**	13.2**	-17.5**	-9.4	-3.5	4.2	16.7	27.5	0.8
Kanpur selection x Co 1	22.9**	25.7**	-11.3	-8.7	-6.8	13.6	54.3**	34.9	10.6
EC 22237 x K 1	4.4	0.7	8.4	-3.7	14.0*	11.6	25.3	25.0	-4.4
EC 22237 x K 2	17.3**	17.2**	0.8	-1.9	2.4	8.4	-13.0	23.8	-14.5*
EC 22237 x Co 1	14.9**	19.1**	-20.1**	14.6	-7.4	16.7	56.0**	3.8	11.3
SE ±	1.2	0.9	8.3	0.9	1.3	0.4	2.6	4.6	1.9

Kanpur selection x Co 1 followed by K 74 x Co 1 and EC 68415 x Co 1. None of the hybrids recorded significant heterosis over better parent which indicated the absence of over dominance for this trait. Highest degree of positive heterosis over better parent was observed in the hybrid EC 100101 x K 2, though not significant. The present results confirmed that average x average or average x low cross combinations showed high heterosis indicating the possibilities of variety x inbred cross. This finding is in agreement with the earlier reports by Singh *et al.* (1984)

Mostly heterosis for oil content was in negative direction which could be due to over dominance of genes determining low oil content. This finding is in accordance with the results reported by Pathak *et al.* (1983). Only two hybrids, EC 93617 x Co 1 and EC 22237 x Co 1 recorded significant and positive heterosis for oil content.

The significant heterosis potentiality exhibited by a few hybrids in various characters studied indicated considerable breeding value. Gupta and Khanna (1982) recommended reciprocal recurrent selection since all types of gene action are present in sunflower. Hence, some of the superior cross combinations identified in this study could be utilised for a recurrent selection programme for the improvement of seed yield and oil content so as to obtain superior derivatives in sunflower.

REFERENCES

AYYASWAMY, M.K. 1978. Biometric studies in sunflower. **Proceedings of Sunflower Seminar.** Dept. of Agricultural Botany, Tamil Nadu Agri University, Coimbatore.

CHAUDHARY, S.K. and ANAND, I.J. 1984. Heterosis and inbreeding depression in sunflower. **Crop Improv. 11** (1): 15-19.

GUPTA, K.A. and KHANNA, K.R. 1982. Gene action and heterosis for oil and yield component characters in Sunflower. **Pl. Breed.abstr.,** 5: (1): 5734.

PATHAK, A.R., BASUDEOSINGH and KUKADIA, M 1983 Heterosis in sunflower . **Gujarat agric.J** (1) : 13-16.

SINGH, S.B., LABONA, K.S. and VINK, D.S. 198- Heterosis in variety x inbred crosses of sunflower. **Crop Improv. 11** (1): 35-38.

Madras Agric. J. 77, (9-12): 520-522 (1990)

GRAIN YIELD STABILITY IN KODOMILLET (PASPALUM SCROBICULATUM L.) UNDER RAINFED CONDITIONS

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ABSTRACT

Eight promising kodomillet genotypes were studied to evaluate their stability for grain yield over three seasons. Genotype x environment interaction was found to be non-significant for grain yield. PSC-1 and IPS-147-1 were found stable for varying environments.

KEY WORDS : Kodomillet, Grain yield, stability.

Kodomillet (*Paspalum scrobiculatum* L.), one among the millets, is cultivated in a limited area with an average productivity as low as 180 kg per /ha under rainfed conditions in Andhra Pradesh. Research is limited in this crop. The varieties developed

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