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HETEROSIS FOR YIELD AND YIELD CONTRIBUTING CHARACTERS IN SAFFLOWER (*CARTHAMUS TINCTORIUS* L.)

M. R. MANJARE AND N. D. JAMBHALE

Department of Botany, Mahatma Phule Krishi Vidyapeeth
Rahuri 413722

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ABSTRACT

High heterosis over better parents was recorded in 32 hybrids pooled over three environments for yield and its components in safflower. The hybrids exhibited the maximum heterosis for seed yield/plant followed by seeds/capitulum on secondary branch, secondary branches/plant and seeds/capitulum on primary branch. Highest value of heterosis over better parent (92.3%) was recorded for seed yield/plant in the hybrid MS-1 x NS-1016. In general, hybrids derived from genic male sterile lines gave better performance for seed yield and other characters.

Key words: Heterosis, yield components, safflower.

Safflower is an often cross-pollinated crop. High degree of heterosis for seed yield in safflower has been reported earlier [1–3]. Heterosis in safflower has not been exploited commercially for want of suitable cytoplasmic genic male sterility (cms). In the absence of cms system, genic male sterility offers promise in hybrid development commercially [4–5]. The present study is an attempt to estimate heterosis over better parents (BP) in the hybrids derived from genic male sterile lines and other varieties of safflower.

MATERIALS AND METHODS

Thirty two hybrids were developed by crossing 4 females with 8 males in line x tester mating system. These hybrids were tested at Rahuri for two years and at Pune for one year in randomised block design with three replications. Each entry represented single row of 3 m length with a spacing of 45 x 20 cm. Recommended agronomic practices were followed. Data were recorded on five random plants in each treatment for seven yield characters (Table 1). The data recorded were pooled over the three environments and used to estimate heterosis over better parents.

RESULTS AND DISCUSSION

Considerable amount of heterosis was observed for the characters under study. However, the magnitude varied with the characters (Table 1).

Negative heterosis for flowering in crop like safflower is desirable as it is mainly grown as rainfed crop. In the present study 8 hybrids exhibited significant negative heterosis over their better parent, of which six were derived from genic male sterile lines, indicating their promising role for earliness.

For number of primary branches/plant none of the hybrid could record significant positive heterosis over the better parent. Existence of limited amount of heterosis for this character has been reported earlier [1]. Heterosis over the better parent for number of seeds/capitulum on primary branch ranged from – 45.5 to 37.3% and five hybrids exhibited significant positive heterosis, maximum being in the hybrid A-1 x EC-32012.

Significant positive heterosis over the better parent for number of secondary branches/plant was observed in six hybrids. The hybrid, A-1 x NDS-1, recorded highest heterosis (64.7%). Very high degree of heterosis for number of secondary branches was observed earlier also [2]. Heterosis over the better parent for number of seeds/capitulum on secondary branch ranged from – 27.6 to 76.0% and the hybrids, A-1 x NS-1016, Bhima x NS-1016, MS-2 x BLY-652, MS-2 x JL-1753 and MS-2 x NS-1016 observed to be significantly positive.

Seed weight though associated with the seed yield is negatively correlated with the number of seeds/capitulum. In the present study hybrids MS-2 x Kas-1 (25.1%), MS-2 x NDS-1 (21.4%) and MS-1 x EC-32012 (15.9%) could only exhibit positive significant heterosis over the better parent for seed weight.

Almost all the hybrids exhibited superiority over their respective better parents for seed yield/plant. Out of 32 hybrids, 22 recorded significant positive heterosis, maximum being highest in the hybrid MS-1 x NS-1016 (92.3%). In safflower high degree of heterosis for seed yield was also recorded previously [2, 3, 7].

In the present study expression of heterosis was found to be associated with the heterosis of number of secondary branches/plant and number of seeds/capitulum on secondary branch. The hybrids derived from genic male sterile lines showed considerable promise for earliness as well as for seed yield as compared to the hybrids of other varieties. In the absence of cms in safflower, utilisation of genic male sterility in exploitation of heterosis may be rewarding.

Table 1. Heterosis over better parents for seven characters in safflower

Hybrid	Days to 50% flowering	Primary branches per plant	Seeds per capitulum on primary branch	Secondary branches per plant	Seeds per capitulum on secondary branch	100-seed weight	Seed yield per plant
Bhima x NDS-1	0.0	-36.6**	-16.6	1.1	-27.6	4.7	-3.7
Bhima x NS-1016	-0.5	-2.1	31.4**	4.0	59.5**	-0.4	78.9**
Bhima x Tara	4.0**	8.8	7.4	-19.4	4.0	-3.8	20.3
Bhima x JL-1753	-1.8	18.1	-1.3	8.0	27.7	-12.9*	38.9**
Bhima x SSf-3	0.0	-4.6	-5.1	11.7	-11.0	-0.1	17.5
Bhima x BLY-652	3.8	3.2	4.5	-14.8	16.4	-1.8	5.1
Bhima x Kas-1	-2.1	7.6	20.0	-0.3	-3.2	-2.2	8.4
Bhima x EC-32012	0.3	30.3	19.9	8.5	0.8	1.0	36.1**
A-1 x NDS-1	-1.8	-34.4**	-15.1	64.7**	-14.1	7.1	40.1**
A-1 x NS-1016	1.4	14.3	-3.0	38.6*	76.0**	-7.5	80.0**
A-1 x Tara	1.3	-22.2	9.0	-47.0**	-7.9	1.4	2.0
A-1 x JL-1753	0.6	12.9	14.3	26.7	8.5	-11.6*	43.2**
A-1 x SSf-3	-1.3	-9.2	9.8	15.2	6.7	7.1	38.8**
A-1 x BLY-652	-4.7**	19.4	34.1**	-1.2	12.7	2.8	61.1**
A-1 x Kas-1	-4.2**	9.8	6.7	10.6	7.3	2.7	21.4
A-1 x EC-32012	0.5	14.0	37.3**	13.0	27.3	-6.3	45.2**
MS-1 x NDS-1	-0.1	-36.4**	12.4	-20.6	-16.9	1.1	4.9
MS-1 x NS-1016	2.8**	7.1	16.8	5.2	48.1**	-2.9	92.3**
MS-1 x Tara	-0.1	-14.8	34.6	-3.2	21.9	3.6	50.5**
MS-1 x JL-1753	-3.5**	24.1	11.6	22.1	17.0	-12.1	70.4**
MS-1 x SSf-3	-2.5*	2.1	12.0	11.6	7.6	-9.6	38.4**
MS-1 x BLY-652	0.3	11.2	26.4	10.5	11.0	9.3	50.1**
MS-1 x Kas-1	2.3	32.0	28.8	12.9	10.5	-5.0	27.1
MS-1 x EC-32012	-0.4	3.4	4.2	-18.3	-21.9	15.9*	-3.2
MS-2 x NDS-1	-2.0	-37.5**	-45.5**	38.6*	-24.6	21.4**	36.3*
MS-2 x NS-1016	0.0	3.6	35.9**	12.2	32.1*	-3.2	44.8**
MS-2 x Tara	-2.7*	-7.8	-25.6**	-15.7	8.3	8.1	48.5**
MS-2 x JL-1753	-4.0**	16.7	23.4*	29.6	32.2*	5.5	60.6**
MS-2 x SSf-3	-4.5**	3.3	-21.7*	34.0*	6.1	-4.2	86.1**
MS-2 x BLY-652	-2.0	-6.0	-1.5	3.0	42.7**	7.7	87.5**
MS-2 x Kas-1	-2.5*	1.1	-15.4	43.4*	17.2	25.1**	53.3**
MS-2 x EC-32012	-0.7	2.1	-24.8**	39.2*	4.7	5.8	43.5**

*,**Significant at 5% and 1% levels, respectively.

REFERENCES

1. V. Ranga Rao. 1982. Heterosis for agronomic characters in safflower. Indian J. Genet., **42**: 364–371.

2. B. N. Narkhede and A. M. Patil. 1987. Heterosis and inbreeding depression in safflower. J. Maharashtra Agric. Univ., **12**: 337–340.

3. R. R. Kulkarni, V. D. Patil, A. R. Mahajan and Y. S. Nerkar. 1992. Heterosis for yield and yield contributing characters in safflower. J. Maharashtra Agric. Univ., **17**: 72–75.

4. T. C. Heaton and P. F. Knowles. 1980. Registration of UC 148 and UC 149 male sterile safflower germplasm. Crop Sci., **20**: 254.

5. N. D. Jambhale and Y. S. Nerkar. 1985. An induced dominant gene controlling male sterility in safflower. Z. Pflanzenzuchtg., **95**: 185–188.

6. A. B. Deokar, B. N. Narkhede, S. T. Pawar and J. V. Patil. 1984. Heterosis in safflower. J. Maharashtra Agric. Univ., **9**: 272–274.

7. M. Ramachandram and J. V. Goud. 1982. Components of seed yield in safflower (*Carthamus tinctorius* L.). Mysore J. Agric. Sci., **18**: 113–117.