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HYBRID VIGOUR IN OPIUM POPPY

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ABSTRACT

Four standard varieties of opium poppy were crossed with 31 diversed genotypes. The extent of heterosis in the hybrids over mid and better parents ranged from -32.7 to 105.1 and -42.9 to 77.8% for opium yield and from 40.9 to 145.2 and 43.8 to 134.0% for seed yield, respectively. Leaf area index, number of effective lancings per capsule and morphine content exhibited least heterosis. MOP 187 x IC 42 for opium yield and MOP 379 x IC 30 for seed yield were identified as best crosses based on heterosis.

Key words: Heterosis, opium poppy, opium yield.

The possibility of commercial exploitation of hybrid vigour in opium poppy (*Papaver somniferum* L.) depends on the extent of heterosis for opium content and seed yield and an economical method of producing hybrid seed. The occurrence of heterosis in opium poppy had been reviewed by [1]. An attempt has been made in present investigation to study expression of heterosis in the selected lines of opium poppy to identify suitable parents for production of commercial hybrids in opium poppy.

MATERIALS AND METHODS

The experimental material comprised four cultivars, viz., Jawahar Aphim 16 (JA 16), Indigenous collection 42 (IC 42), IC 30 and Mandsaur Opium Poppy 3 (MOP 3) used as male parents and 31 cultivars viz., MOP 187, MOP 278, MOP 319, MOP 379, MOP 409, MOP 503, MOP 506, MOP 507, MOP 539, IC 1, IC 3, IC 7, IC 18, IC 19, IC 88, IC 90, IC 91, IC 95, IC 111, IC 114, IC 128, UO (Udaipur Opium) 177-2, UO 185, UO 285, NBRI (National Botanical Research Institute) 3, NBPGR (National Bureau of Plant Genetic Resources) 3, NOP (Narendradev Opium Poppy) 1, NOP 4, Ranzatak, Posta 91 and Posta 149 as female parents. One hundred twenty four crosses were made. All the parents and hybrids were grown in randomized block design with two replications during kharif 1988–89 at Mandsaur. Each entry was raised in two 1 m long row at 30 x 10 cm spacing. Observations were recorded on

five random plants in each plot for opium yield, seed yield, husk yield, leaf area index, number of effective lancing per capsule, and morphine content.

Table 1. Number of significant crosses, range of heterosis, parental mean, and heterosis for different characters in opium poppy

Heterosis over midparent				Heterosis over better parent			
No. of significant crosses	range	cross	hetero-sis %	No.of significant crosses	range	cross	hetero-sis %
Opium yield/plant (g)							
19	– 32.7–105.1	MOP 187 x IC 42 (0.167) (0.230)	105.1	14	– 42.9–77.8	MOP 187 x IC 42 (0.167) (0.230)	77.8
		IC 19 x MOP 3 (0.199) (0.147)	81.6			NOP 1 x MOP 3 (0.125) (0.147)	62.8
Seed yield/plant (g)							
39	40.9–145.2	MOP 187 x IC 30 (2.2) (2.5)	145.2	16	43.82–134.0	MOP 379 x IC 30 (2.3) (2.5)	134.0
		MOP 379 x IC 30 (2.3) (2.5)	143.7			MOP 187 x IC 30 (2.2) (2.5)	128.0
Husk yield/plant (g)							
21	– 71.6–131.2	MOP 379 x IC 30 (3.2) (3.2)	131.2	11	– 76.5–131.2	MOP 379 x IC 30 (3.2) (3.2)	131.2
		MOP 187 x IC 42 (3.4) (4.5)	100.2			IC 1 x IC 30 (3.7) (3.2)	82.4
Leaf area index (cm^2)							
18	– 53.6–79.4	IC 7 x JA 16 (6.58) (3.39)	79.4	3	– 8.7–59.4	MOP 507 x IC 30 (5.29) (5.70)	59.4
		IC 18 x JA 16 (5.0) (3.4)	70.1			IC 7 x JA 16 (6.58) (3.39)	55.2
No. of effective lancings/capsule							
9	– 26.7–39.0	IC 18 x MOP 3 (2.3) (2.5)	39.0	4	– 29.2–32.9	IC 18 x MOP 3 (2.3) (2.5)	32.9
		UO 177-2 x IC 30 (1.8) (1.8)	33.0			UO 177-2 x IC 30 (1.8) (1.8)	33.0
Morphine content (%)							
11	– 29.0–37.4	IC 90 x IC 30 (11.7) (11.3)	37.4	11	– 29.9–35.0	IC 90 x IC 30 (11.7) (11.3)	35.0
		Posta 91 x IC 30 (12.1) (11.3)	21.4			Posta 91 x IC 30 (12.1) (11.3)	17.3

Note. Parental means given in parentheses.

RESULTS AND DISCUSSION

Heterosis over midparent (MP) and better parents (BP) for opium yield varied from – 32.7 to 105.1 and – 42.9 to 77.8%, respectively (Table 1). Significant positive heterosis was recorded in 19 and 14 crosses over MP and BP, respectively. The MP and BP heterosis ranged from 40.9 to 145.2 and 43.8 to 134.0% for seed yield, respectively. Significant positive MP and BP heterosis was observed in 39 and 16 crosses, respectively for husk yield which was in the range of – 71.6 131.3 (MP) and – 76.5 131.3% BP. The lowest mean heterotic effects were observed for leaf area index, number of effective lancing per capsule, and morphile content. The maximum level of BP heterosis was recorded to be 46.3% for opium yield and 37.1% for morphile content [2]. Heterosis for opium content, seed and husk yield, and morphine content has been reported both in negative and positive directions by several workers [3–5].

The two best crosses recording maximum heterosis for different characters are presented in Table 1. The hybrids MOP 187 x IC 42 for opium yield, MOP 379 x IC 30 for seed and husk yield, and IC 90 x IC 30 for morphine content were the best. The maximum yield of opium among the parents was 320 mg/plant in IC3 as compared to the maximum yield of 408 mg/plant in the hybrids. MOP 187 x IC 42. MOP 187, MOP 379, IC 42 and IC 30 can be used as parents for future commercial hybrids. Since hand emasculation is easy in opium poppy, commercial exploitation of hybrid vigour is possible in the same way as in cotton.

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