

Short Communications

Heterosis In Sunflower*

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In order to realize substantial production improvement in allogamous crop plants, studies on heterosis merits special consideration. The success of the method, however, depends upon the magnitude of heterosis, gene action involved and floral morphology of a crop species. The extensive review of heterosis is elaborated by Gowen (1952) and Rai (1980). Heterosis breeding (Gundae, 1966) and synthetic breeding (Putt, 1966) are the most effective methods of utilizing heterosis in sunflower. Exploitation of heterosis in sunflower may result in an increase in yield upto 78 per cent over better parent (Vranceanu and Stoenscu, 1969).

Seven inbred parents along with their 21 single cross hybrids, produced in a diallel fashion excluding reciprocals, were grown each in a seven-rows plot of 5 m length spaced at 60 cm apart in a randomized-block design with four replications during *rabi* 1977. Heterosis was calculated as per cent inc-

crease (+) or decrease (-) of F_1 over parental performance for days to 75% flowering and maturity, plant height (cm), head diameter (cm), 1000 - seed weight (g), yield/plant (g), seed filling (%), seeds/plant, husk content (%), and oil content (%).

Marked heterosis was observed in several crosses for almost all the characters. But in practical breeding programme, the expression of heterosis could be considered useful only when it manifests superiority over the local or check variety. Taking this view into consideration the most popularly grown sunflower varieties, EC 68413 (PEREDOVIK) and EC 68414 (VNIIMK) were also included for comparison. Thirteen crosses exhibited high heterosis in desired direction for seed yield per plant over mid-parent value. The highest relative heterosis and heterobeltiosis were recorded in PIL 1602 x PIL 2270 (174.90 per cent and 147.99 per cent). When compared to better parents, six hybrids viz., PIL 1602 x PIL 2270; PIL 1749 x PIL 2270; PIL 1749 x PIL 3741; PIL 3355 x PIL 3741; PIL 1602 x PIL 2358 and PIL 2358 x PIL 3741 gave high heterobeltiosis. Twelve crosses showed superiority over check EC 68413. On the other hand, four

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TABLE I
Per cent heterosis for various characters in sunflower.

Character	Range for desired heterosis over		F_{1s} showing desirable heterosis over		Best check
	Midparental value	Better parent	Midparental value	Better parent	
Days to 75% flowering	-3.57 to -7.77	-4.37 to -5.77	PIL 2358 x PIL 3355	PIL 2358 x PIL 2965	PIL 1749 x PIL 2270
Days to 75% maturity	-3.50 to -5.03	-4.72	PIL 2358 x PIL 2965	PIL 2358 x PIL 2965	PIL 1749 x PIL 2270
Plant height	—	—	—	—	PIL 1602 x PIL 2358
Head diameter	8.55 to 38.87	10.51 to 28.77	PIL 1749 x PIL 3741	PIL 1602 x PIL 2270	PIL 1749 x PIL 3741
1000 - seed weight	6.50 to 28.24	70.18 to 22.67	PIL 1602 x PIL 2358	PIL 1602 x PIL 2358	PIL 1602 x PIL 3741
Yield/plant	13.73 to 174.90	15.22 to 147.99	PIL 1602 x PIL 2270	PIL 1602 x PIL 2270	PIL 1602 x PIL 2270
Seed filling	6.73 to 18.85	7.45 to 13.33	PIL 2270 x PIL 3741	PIL 2270 x PIL 3741	PIL 2358 x PIL 3741
Seeds/plant	8.68 to 183.83	25.96 to 157.28	PIL 1602 x PIL 2270	PIL 1602 x PIL 2270	PIL 1602 x PIL 2270
Husk content	-8.89 to -18.00	-14.53	PIL 2358 x PIL 3741	PIL 2358 x PIL 3741	PIL 2358 x PIL 3741
Oil content	5.53 to 7.44	4.00 to 6.56	PIL 2965 x PIL 3741	PIL 2965 x PIL 3741	—

crosses, PIL 1602 x PIL 2270 (33.1 per cent), PIL 1749 x PIL 3741 (25.76 per cent); PIL 2270 x PIL 2965 (18.01 per cent) and PIL 1602 x PIL 2358 (14.72 per cent) resulted in significant heterosis over high yielding check, EC 684 14. The cross PIL 1602 x PIL 2270 gave the highest standard heterosis over both the checks. Heterosis for yield has been reported earlier by Unrau and White (1944), Schulze (1960), Schuster (1964), Putt (1966), Grebenjuk (1967), Vranceanu and Stoenscu (1969), Kovacik and Skaloud (1972), Vol'f and Dumacheva (1972), Setty (1974), Kloczowski (1975), Klimov and Ermoshin (1977). The expression of heterosis in these hybrids could primarily be attributed to complementary combination of more number of seeds per plant, head diameter, seed filling and to some extent 1000-seed weight.

In the present investigation, hybrids have not shown their superiority for short plant stature which is akin to the findings of Putt (1966), Schuster (1964) and Stoyanova *et al.* (1971). Out of the highest yielding seven crosses, only one cross PIL 1749 x PIL 2270 exhibited significant standard heterosis for early maturity over EC 684 14. On the other hand, four hybrids resulted in significant heterosis over EC 684 13 for early maturity. Putt (1966) also reported heterosis for earliness.

Three crosses showed some heterosis over better parent for oil content ranging from 4.00 to 5.56 per cent. Stoyanova *et al.* (1971) also reported an average heterosis of 5 per cent for oil content. However, in the present investigation, in general, heterosis for oil content was in negative direction which could be due to overdominance of genes determining the low oil content (Hayes *et al.* 1955). It may also be ascribed to the fact that the parents

may have genes with similar gene frequency (Falconer, 1960). Similarly negative heterosis for oil content was reported in brown sarson (Swamy Rao, 1970).

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