

HETEROTIC EFFECT FOR SEED YIELD AND COMPONENT CHARACTERS
IN SUNFLOWER OVER SEASONS

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ABSTRACT

A total of 24 single cross hybrids derived from four cytoplasmic male sterile lines and six restorer lines were evaluated across three seasons (rainy, post-rainy and summer) to estimate average heterosis for seed yield and component characters. Over seasons lowest heterotic effect was observed for days to flowering and highest for seed yield. Amongst component characters, leaf area, drymatter production, head diameter, seed weight and stem girth had relatively higher heterotic effect. Husk content and Oil content had low magnitude of heterotic effect. Leaf area, total dry matter production, head diameter and seed weight contributed to the extent of 78 per cent in the expression of heterotic effect for seed yield. The average heterosis calculated season-wise exhibited similar trend of heterotic effect for seed yield and component characters, which implied that heterotic effect is stable over environments. Two hybrids, viz, CMS-851 x RHA-274 and CMS-234 x NDRLOS-6 were high yielding over three seasons. Selection of Parental lines with high mean values across seasons for yield and component characters would help in realising high yielding hybrid cultivars in heterosis breeding programmes.

INTRODUCTION

India is one of the major sunflower growing countries in the Asian continent. It is cultivated over an area of 1.42 m ha with annual production of 0.59 mt (year 1989-90). Low productivity (421 kg/ha) is mainly attributed to large scale cultivation of open pollinated varieties predominantly in rainfed condition. Being

photo-period insensitive, sunflower is cultivated in rainy, post-rainy and summer seasons. In recent years farmers have shown interest in cultivation of single-cross sunflower hybrids in rainfed situation mainly because of high productivity of hybrids over open pollinated varieties. In the present study, therefore, an attempt has been made to estimate extent of heterosis in 24 single cross hybrids for yield and its components over three seasons, and identify high yielding hybrid/s over seasons.

MATERIAL AND METHODS

The base material comprised 4 CMS lines and 6 restorers which were crossed in Line x Tester mating design to obtain 24 single cross hybrids. The 10 parental lines along with 24 hybrids were evaluated in randomised block design with 3 replications over three seasons. The trials were planted on 24-7-1990 (rainy season), 9-10-1992 (post-rainy season) and 11-1-1992 (Summer-season). Each replication contained single-row (4.5 m length) of 34 genotypes. A spacing of 60 cm between rows and 30 cm within a row was adopted. Package of practices recommended for the crop was adopted in all the three growing seasons. Date on seed yield per plant, days to 50 per cent flowering, leaf area (Singh and Yadav, 1976), total drymatter at the time of harvest, plant height, head diameter, stem girth, 100-seed weight were recorded in each replication on 5 random competitive plants in parents and experimental hybrids. Oil content was determined using NMR-spectrometer. Parental and F_1 generation means were used to calculate average heterosis $(\bar{F}_1 - \bar{P} / \bar{P} \times 100)$.

RESULTS AND DISCUSSION

The mean performance of parents and their hybrids for seed yield and component characters across three seasons, viz; rainy, post-rainy and summer seasons are presented in Table-1. Amongst four CMS lines used, CMS-234 recorded highest yield followed by CMS-400 and CMS-851, while NDRLOS-1-1 and RHA-298 were top yielders amongst 6 restorer lines. Amongst 24 single-cross hybrids, five crosses, viz, CMS-851 x RHA-274, CMS-234 x NDRLOS-6, CMS-851 x RHA-298, CMS-234 x RHA-298 and MCS-400 x

RHA-274 (in order) were the high yielding hybrids across three seasons. CMS-301 and NDRLOS-2 recorded 53 days to flower while RHA-298 recorded 64 days to flower. Amongst parental lines CMS-234, CMS-851 had highest oil content, while CMS-851 x NDRLOS-1-1 and CMS-851 x NDRLOS-6 recorded highest oil content of 40 per cent across three seasons.

An examination of the data on the extent of average heterosis revealed that it varied from -0.53 per cent recorded for days to 50 per cent flowering to as high as 172 per cent for seed yield. Amongst component characters, leaf area (91 per cent) followed by drymatter (49.19 per cent), head diameter (44.25 per cent), 100 seed weight (38.89 per cent) and plant height (33.33 per cent) recorded higher magnitude of heterotic effect. The results of the present study, are in agreement with earlier reports of Putt (1935), Seetharam et al 1977, Singh et al (1978) and Giriraj et al (1986). The degree of heterotic effect was on lower magnitude for husk content and oil content. The negative heterotic effect for days to flowering implied early flowering over their parents.

Average heterosis data obtained season-wise (rainy, post-rainy and summer seasons) also exhibited almost similar trend of heterotic effect for seed yield and component characters. It implied that heterotic effect is stable over environments.

According to Grafius (1959), heterotic effect for seed yield is manifested through its component characters. In the present study, it is apparent that heterosis for seed yield can be accounted to the manifestation of heterosis in leaf area, dry matter production, head diameter, seed weight and stem girth. Considering the expression of heterosis for seed yield as 100 per cent, the contribution of six component characters towards seed yield was assessed. The results revealed that leaf area, total dry matter, plant height, head diameter, stem girth and seed weight contributed 32.12, 17.36, 11.76, 15.62, 9.41 and 13.72 per cent towards seed yield. The results of the present study are in confirmity with earlier findings of Giriraj et al (1986). Based on the results of the present study, it can be inferred that in the selection of parental lines in heterosis breeding programme, major emphasis has to be given on leaf area, drymatter

Table-1 Parental and F_1 generation means over three seasons for seed yield and component characters

	Seed yield (gm)	Days to flowering	Leaf area (dm ²)	Dry matter production (g/plant)	Plant height (cm)	Head diameter (dm)	100 seed weight (g)	Oil content (%)
Parents	15.4	56.4	205	86.6	1.1	10.5	3.6	33.6
Hybrids	41.9	56.1	392.3	129.2	1.6	15.8	5.0	36.3
CD	9.90	1.62	50.93	11.93	0.11	1.3	0.83	2.96
Average heterosis %	172.08	-0.53	91.36	49.19	45.45	46.25	38.89	8.04

production, head diameter, seed weight, plant height and stem girth for realising high yielding single cross hybrids. Besides, the results also helped in identifying two high yielding hybrids viz., CMS-851 x RHA-274 and CMS-234 x NDRLOS-6 across three seasons.

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