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HETEROSIS IN COTTON *G. HIRSUTUM* L. UNDER TWO PRESOWING TEMPERATURE CONDITIONS.

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Heterosis in crosses involving local and exotic cotton varieties was studied in three characters, namely, number of bolls per plant, yield of seed cotton and ginning outturn under two presowing temperature regimes (5°C and room temperature) during normal crop season. The plants were grown to maturity in the pots. In general, the hybrids showed greater heterosis after treatment of seeds at low temperature than the control. The extent of heterosis was significantly higher for number of bolls and yield of seed cotton while there was a little effect on ginning outturn. Differences among the hybrids under both the conditions were quite apparent.

INTRODUCTION

Hybrid vigour has been commercially exploited in a variety of crops like maize, sorghum, onion and tomatoes. Efforts are also under way to explore this possibility in crops like wheat and cotton (Hutchinson *et al.*, 1938; Singh *et al.*, 1964; Baluch and Memon, 1966; Lee *et al.*, 1967; Marani, 1968 and Moneium, 1972). Literature is also available on other crops. Out of all these species the cotton plant is very sensitive to changes in the environments both at the macro and micro-levels. Therefore, for utilization of hybrid vigour in cotton, the study of the hybrid vigour under different environmental regimes seems important. An investigation was made in hybrid vigour for different traits in cotton and results reported which could be of interest to cotton breeders.

MATERIALS AND METHODS

To estimate the effect of presowing temperature, 5°C applied for 24 hours versus normal F_1 seeds, the following crosses were made:

1. AC 134 × Sahil GL GL 4.
2. AC 134 × (539 × 1298 GL GL 4).
3. AC 134 × Delfos
4. AC 134 × (539 × 1298).

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5. 149F × Russian Mutant.
6. 149F × (539 × 1298 GL GL 4).
7. 149F × (539 × 1298).
8. 149F × (Coker 43 × 1517 C).

Five F_1 seeds of each cross were sown in each pot separately during 1975–76 which were later on thinned to two plants. Parents were also sown in separate pots. There were three replications in this trial and care was taken to have as normal a growth of the plants as possible. The data on the characters such as number of bolls per plant, yield of seed cotton and ginning outturn were collected and subjected to statistical analysis to ascertain the effect of experimental treatments on various traits.

Table 1 : *Average number of bolls per plant in F_1 generation under temperature stressed and non-stressed conditions.*

Name of Cross	Stressed condition			Non-stressed condition		
	Mid parent	F_1 hybrid	Percentage increase or decrease of F_1 over mid parent	Mid parent	F_1 hybrid	Percentage increase or decrease of F_1 over mid parent
AC134 × Sahil GL GL4	2.54	3.22	+26.77	2.79	2.00	−28.31
AC134 × (539 × 1298 GL GL4)	1.81	2.31	+27.62	2.35	1.94	−17.44
AC134 × Delfos	2.89	2.09	−27.68	3.67	2.90	−20.98
AC134 × (539 × 1298)	2.01	3.50	+74.12	2.40	1.70	−29.16
149F × Russian Mutant	3.46	4.83	+39.59	3.66	6.67	+82.24
149F × (539 × 1298 GL GL4)	2.13	2.38	+11.73	1.83	1.64	−10.38
149F × (539 × 1298)	2.08	5.00	+140.38	1.73	3.17	+83.23
149F × (Coker 43 × 1517C)	1.41	2.50	+77.30	1.68	2.43	+44.64
Mean percentage increase or decrease :			±46.23			+12.98

RESULTS AND DISCUSSION

Number of Bolls per Plant :

Table 1 showed that in the case of stressed condition all the crosses except AC 134 × Delfos gave better results when compared with mid-parental value. The maximum hybrid vigour, i. e., 140.38 per cent was shown by the 149F × (539 × 1298) cross.

In the case of non-stressed condition, the crosses, 149F × Russian Mutant, 149F × (539 × 1298) and 149F × (Coker 43 × 1517 C) indicated hybrid vigour over their mid-parents to the extent of 82.24, 83.23 and 44.64%, respectively.

On an overall basis it was observed that heterotic expression varied with the situation. Similar results were reported by Singh *et al.* (1964), Mirza (1969) and Moncium (1972) while working on cotton (*G. hirsutum* L.).

Yield of Seed Cotton :

Table 2 : *Average yield of seed cotton (gms) in F_1 generation under temperature stressed and non-stressed conditions.*

Name of Cross	Stressed condition			Non-stressed condition		
	Mid parent	F_1 hybrid	Percentage increase or decrease of F_1 over mid parent.	Mid parent	F_1 hybrid	Percentage increase or decrease of F_1 over mid parent.
AC134 × Sahil GL GL4	5.09	6.83	+34.18	6.07	4.40	−27.51
AC134 × (539 × 1298 GL GL4)	3.53	5.66	+60.33	5.27	4.80	− 8.91
AC134 × Delfos	5.98	4.68	−21.73	5.68	5.47	− 3.69
AC134 × (539 × 1298)	4.08	7.75	+89.95	4.53	4.00	−11.69
149F × Russian Mutant	8.16	9.25	+13.35	8.03	8.12	+ 1.12
149F × (539 × 1298 GL GL4)	3.43	4.20	+22.44	4.39	5.09	+15.94
149F × (539 × 1298)	5.25	11.30	+115.23	3.28	7.71	+135.06
149F × (Coker 43 × 1517C)	3.04	5.25	+72.69	3.38	4.29	+26.92
Mean percentage increase or decrease :			+48.30			+15.90

The data given in Table 2 revealed that under stressed condition all the crosses except AC 134 × Delfos gave higher yield of seed cotton as compared to mid parents. The crosses, 149F × (539 × 1298), 149F × (Coker 43 × 1517C), AC 134 × (539 × 1298) and AC 134 × (539 × 1298 GL GL 4), showed maximum heterosis for yield of seed cotton.

As to non-stressed condition, four crosses, namely, 149F × Russian Mutant, 149F × (539 × 1298 GL GL 4), 149F × (539 × 1298) and 149F × (Coker 43 × 1517C) proved better over their mid parents.

A comparison of both the temperature regimes revealed heterosis of varying degrees under each situation. Under stressed condition the magnitude of heterosis over mid parents varied from 13.35 per cent to 115.23 per cent and for the normal condition, it ranged from 1.12 to 135.06 per cent. Generally, a fair degree of heterosis was observed for this character, though heterotic expression was influenced by the environments. Similar results were reported by Lee *et al.* (1967), Djokie (1966), Baluch and Memon (1966), Sinolinding and Chaudhry (1974), while working on cotton and wheat, and by Harrington (1946) on barley.

Ginning Outturn :

A reference to Table 3 revealed that in stressed condition all the crosses except AC 134 × (539 × 1298 GL GL 4) showed higher values for the ginning outturn as compared to their mid parents. The cross 149F × (539 × 1298) was the best and showed 17.49 per cent heterosis. In the case of non-stressed condition, it was observed that six crosses out of eight showed better performance than their mid parents.

From the foregoing account, it is obvious that different cross combinations showed differential response for boll number, yield of seed cotton and ginning outturn under stressed condition.

Table 3: *Average ginning outturn percentage for F_1 generation under temperature stressed and non-stressed conditions.*

Name of Cross	Stressed condition			Non-stressed condition		
	Mid parent	F_1 hybrid	Percentage increase or decrease of F_1 over mid parent	Mid parent	F_1 hybrid	Percentage increase or decrease of F_1 over mid parent
AC134 × Sahil GL GL4	33.27	32.52	+ 0.77	34.56	35.23	+ 1.93
AC134 × (539 × 1298 GL GL4)	34.42	33.51	− 2.64	31.36	33.91	+ 8.13
AC134 × Delfos	30.64	32.04	+ 4.56	32.71	31.81	− 2.75
AC134 × (539 × 1298)	31.51	32.26	+ 2.38	31.37	35.00	+11.57
149F × Russian Mutant	31.39	36.04	+14.81	32.10	31.79	− 0.96
149F × (539 × 1298 GL GL4)	36.35	36.61	+ 0.71	30.50	31.25	+ 2.45
149F × (539 × 1298)	30.13	35.40	+17.49	28.94	31.89	+10.19
149F × (Coker 43 × 1517C)	29.74	34.52	+16.07	30.20	35.00	+15.89
Mean percentage increase or decrease :			+ 6.77			+ 5.83

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