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A Note on the Behaviour of Three Inter-Racial Hybrids in *Gossypium Arboreum* L.

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Introduction: Since 1937, detailed studies were undertaken at Coimbatore towards a comprehensive understanding of the effects, and basis of the phenomenon of heterosis in all the four cultivated species of *Gossypium*; (Santhanam, 1951; unpublished*). This note records the observations made on three inter-racial hybrids in G. *arboreum* L. during 1950–'51 in continuation of this programme of work.

The cultivated cottons of the Old World group fall under either of the two species G. *arboreum* L. or G. *herbaceum* L. The former is separated into six geographical races, *burmanicum*, *indicum*, *bengalense*, *cernuum*, *soudanense* and *sinense* (Silow, 1944; Hutchinson, 1947).

Materials and Methods: The following parent types figure in the crosses studied now:

1. NR 5 (G. *arboreum* race *bengalense*) — A selection from Khandesh cotton obtained from Jalgaon (Bombay).
2. Burma C 19 (G. *arboreum* race *burmanicum*) — A variety obtained from Burma.
3. Cernuum Garohills (G. *arboreum* race *cernuum*) — A variety of hill cotton obtained from Garohills district in Assam.
4. N. M. Dollar (G. *arboreum* race *sinsense*) — A reselection from Million Dollar of China obtained from Bombay.

The yield and quality attributes of the parent types are included in Table I.

The following three inter-racial crosses were studied for their F_1 behaviour as compared with the constituent parental attributes.

1. NR 5t x Cernum (*bengalense* x *cernuum*)
2. Burma C 19 x Cernuum (*burmanicum* x *cernuum*)
3. N. M. Dollar x Cernuum (*sinense* x *cernuum*)

The F_1 hybrids and the respective parent types were raised in replicated plots adopting the randomised progency row design of Hutchinson and Panse (1937). The total variants were seven and the experimental area comprised of single-row plots of five holes each, replicated 4 times with 18 degrees of freedom for error.

Observations were recorded on final growth in terms of height (c.m.) and number of nodes produced, position of first sympodial node, flower and boll production; yield of kapas (gm.), combed halo length (m.m.), lint index in gm. (weight of lint obtained from *kapas* sample containing 100 seeds) and seed index (weight of 100 seeds in gm.).

The experimental results were analysed statistically and the the numerical differences in values between the first generation hybrids and corresponding parents tested for significance (Fisher 1938).

Plot totals were used for the analysis of variance of flower and boll production and yield of *kapas*. In the case of other attributes mean values per plant were worked out and analysed.

The differences of the F_1 values from the average of the constituent parental values was studied in comparison with the difference of F_1 from the 'higher' parent. Heterosis was finally interpreted on the basis of significant transgression of the 'dominant' parent.

Experimental results: The results of observations are furnished in Table I.

TABLE I.

Performance of inter-racial hybrids in G. arboreum.

	Mean values			Diff. of F-1 from higher parent	Critical Diffce.	Significance for heterosis
	F 1 hybrid	Ovule parent	Pollen parent			
(1)	(2)	(3)	(4)	(5)	(6)	(7)
I. Height in cm.:						
1. NR 5 x Cernuum	46·6	40·5		+ 6·1		No
2. Burma C 19 x ,,	40·0	31·6	34·2	+ 5·8	15·9	No
3. N. M. Dollar x ,,	58·8	55·1		+ 3·7		No
II. Nodes:						
1. NR 5 x Cernuum	22·7	22·2				
2. Burma C 19 x ,,	22·8	24 2	21·7	'F' test not satisfied		
3. N. M. Dollar x ,,	22·8	23·4				
III. First sympodial node:						
1. NR 5 x Cernuum	6·2	6·6				
2. Burma C 19 x ,,	7·1	7·3	7·1	'F' test not satisfied		
3. N. M. Dollar x ,,	6·1	5·7				
IV. Flower production:						
1. NR 5 x Cernuum	32 7	32·8		— 0·1		No
2. Burma C 19 x ,,	41·3	42·8	11·5	— 1·5	9·8	No
3. N. M. Dallar x ,,	32 9	22 8		+ 9·2		No
V. Boll production:						
1. NR 5 x Cernuum	22·3	16·1		+ 6·2		No
2. Burma C 19 x ,,	29·0	23·0	6·8	+ 6·9	9·9	No
3. N. M. Dollar x ,,	21·8	11·1		+10·7		Yes
VI. Yield of kapas in gm.						
1. NR 5 x Cernuum	41·9	34·6		+ 7·3		No
2. Burma C 12 x ,,	49·2	23·3	10 8	+25·9	19·7	Yes
3. N. M. Dollar x ,,	43·8	15·9		+27·9		Yes
VII. Halo length in m. m.:						
1. NR 5 x Cernuum	18 8	14·7		— 1 0		No
2. Burma C 19 x ,,	20·1	19·0	19·8	+ 0 3	1·8	No
3. N. M. Dollar x ,,	22·0	21·8		+ 0·2		No
VIII Lint index in gm.:						
1. NR 5 x Cernuum	3·57	4·24		— 0·67		No
2. Burma C 19 x ,,	2·98	2·79	2·6:	+ 0·19	0·48	No
3. N. M. Dollar x ,,	3·09	2·24		+ 0·46		No
IX. Seed index in g. m.:						
1. NR 5 x Cernuum	5·72	5·87				
2. Burma C 19 x ,,	5·02	5·29	4·56	'F' test not satisfied		
3. N. M. Dollar x ,,	6·51	7·52				

In final growth reckoned as height, although all the three F_1 hybrids have recorded uniformly higher values than either parent, the level of statistical significance has not been reached. The total number of nodes produced at maturity, the parent types and hybrids do not differ from one another. Similarly in the case of first sympodial node also, the 'F' test is not satisfied.

Among the productivity characters studied, consistent trends towards increase in F_1 are observed in the number of bolls produced and yield of *kapas*. The N. M. Dollar x Cernuum F_1 hybrid exhibits significant heterosis in both boll production and *kapas* yield, while the Burma C 19 x Cernuum hybrid shows significant transgression in the latter attribute only.

Heterosis effects are not observed in halo length, lint index or seed index.

Discussion: The parent types utilised in these crosses represent four different geographical races within G. *arboreum* L. However, of the nine attributes studied in the three inter-racial hybrids and respective parents, heterosis effects are observed only in yield characters in two of the hybrids, viz. Burma C 19 x Cernuum and N. M. Dollar and Cernuum. The intra-species differentiation in G. *arboreum* has been shown to be of a low level due to the late establishment of divergent selection trends and the incomplete and sometimes transient geographical isolation (Hutchinson and Silow, 1947). Hence it is probable that there exists low genetic diversity between the parents in most of the characters studied excepting the productivity attributes, thus accounting for the general absence of significant heterosis effects in the former. Yield being the most important character subjected to continuous and conscious as well as unconscious selection pressure, it is quite likely that the parent types have accumulated different complexes of modifier genes favourable for high yield. Still another feature to be considered is the influence of environment on the expression of heterosis effects in crosses between parent types new to the place of study. Further studies have been programmed in this direction.

Summary: Observations were made on three inter-racial hybrids in G. *arboreum* L. for heterosis effects, if any, in nine attributes.

The *sinense* x *cernuum* and *burmanicum* x *cernuum* first generation hybrids exhibited significant heterosis in yield of *kapas*, while the former showed significant transgression in boll production as well.

Low level of intra-species differentiation in G. *arboreum* and influence of environment new to the parents involved are suggested as possible causes for the non-significant levels of heterosis expression.

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A Note on Fruit-Cracking in Arecanut

The arecanut palm is susceptible to many pests and diseases and remedial measures have been evolved in the case of a few. Nambiar (1949) mentions a phenomenon characterised by the cracking of fruits on the tree, known as *Anduodakke roga* prevalent in Mysore. This is noticed in Ponnani taluk of Malabar District also, where it is known as *Achikeeral*.

Preliminary surveys conducted in three representative gardens show that fruit-cracking occurs to the extent of about three per cent in the Ponnani taluk. The trees showing the symptoms are generally very healthy. When the nuts are half to three-fourths mature, they crack at the tips and split longitudinally towards the base exposing the kernals which also sometimes crack and as a result become malformed. All the nuts in a bunch and all the bunches on a tree in turn succumb to the cracking which occurs on the same tree year after year. From a random survey made in three gardens comprising 2,350 trees it was noted that the affected trees are not confined to any particular level, situation or soil which is typical lateritic loam having sufficient drainage throughout. The age of the trees also does not appear to have any influence on its incidence, as it varies from 12 years to 25 years.