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GENETIC ANALYSIS OF YIELD AND YIELD COMPONENTS IN INTRASPECIFIC CROSSES OF *GOSSYPIUM HIRSUTUM* L.

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Abstract

Combining ability analysis was conducted for yield and yield components in line x tester involving 5 lines and 3 testers. Combining ability variances for GCA of lines and SCA variances were highly significant for boll number and seed cotton yield per plant, suggesting the importance of additive and non-additive type of gene action for these traits. The cultivar BH-36, CIM-240 and CYTO-129 exhibited significant GCA effects for boll number and S-12 and CYTO-129 for seed cotton yield. The female parent CYTO-129 proved to be good general combiner for boll number and seed cotton yield per plant. SCA effects of the crosses S-12 x CRIS-52, CIM-240 x CYTO 129 and NH-26 x NIAB-78 were considerably high for number of bolls and seed cotton yield per plant. Hence, while breeding varieties for high yield these crosses should be considered.

Introduction

Combining ability deals with the capacity of a parent to produce superior progenies when combined with another parent. It is not possible to foresee the combining ability of two parent merely on the basis of the knowledge of their traits. Only the recombination of parental traits may be expected with a degree of certainty. Khan *et al.*, (1980), Rahman *et al.*, (1991), Khan & Ghafoor, (1991) and Tang Bing *et al.*, (1993) have reported both type of additive and non-additive gene action for boll number and seed cotton yield per plant. Analysis of some important cotton cultivars was carried out to ascertain the relative performance regarding their general and specific combining ability.

Materials and Methods

General and specific combining ability effects of parents and 15 F_1 hybrids was carried out. The traits studied were sympodia, number of bolls, boll weight and seed cotton yield per plant. The experimental material was planted in randomized complete block design with 3 replications. Ten plants per replication from each genotype were selected at random for recording the data of various quantitative traits. Data thus obtained for each character was subjected to statistical analysis followed by Steel & Torrie (1980) and analysis of GCA and SCA effects by using line x tester analysis method of Kempthorne (1957).

Table 1. Average performance and ANOVA (mean squares) for genotype means and combining ability of F_1 hybrids and their parents for various traits.

Genotypes	Sympodia/ plant	Boll No.	Boll Wt. (gms)	Seed Cotton yield per plant (gms)
S-12 X CRIS-52	23.00 cd	75.00 a	2.60 de	182.86 ab
S-12 X CYTO-129	22.66 cd	48.00 bc	2.60 de	127.33 cdefg
S-12 X NIAB-78	20.00 cd	44.33 bcd	3.23 a	142.46 bcd
CRIS-7A X CRIS-52	17.00 d	43.66 bcd	2.80 de	123.16 cdefg
CRIS-7A X CYTO-129	20.00 cd	46.33 bc	2.90 de	133.70 cdef
CRIS-7A X NIAB-78	17.00 d	48.00 bc	3.36 a	163.43 abc
BH-36 X CRIS-52	25.00 bc	60.33 ab	2.13 cde	120.10 cdefgh
BH-36 X CYTO-129	24.00 cd	69.66 a	2.93 abcd	195.33 a
BH-36 X NIAB-78	21.66 cd	60.66 ab	1.90 e	115.96 defghi
CIM-240 X CRIS-52	24.33 bcd	44.66 bc	1.93 e	89.93 fghij
CIM-240 X CYTO-129	20.33 cd	76.33 a	2.13 cde	163.76 abc
CIM-240 X NIAB-78	20.66 cd	59.00 ab	2.13 cde	118.00 defghi
NH-26 X CRIS-52	19.00 cd	23.66 e	3.56 a	86.26 ghij
NH-26 X CYTO-129	19.33 cd	38.66 cde	2.60 de	95.13 efghij
NH-26 X NIAB-78	23.33 cd	41.00 bcde	3.10 ab	127.66 cdefg
S-12	18.33 cd	31.00 cde	3.66 a	113.76 defghi
CRIS-7A	24.00 cd	29.96 cde	2.23 bcde	67.31 j
BH-36	31.66 ab	31.33 cde	3.03 ab	97.16 efghij
CIM-240	20.33 cd	31.66 cde	2.20 de	72.90 ij
NH-26	34.00 a	26.00 de	3.00 abc	75.96 hij
CRIS-52	33.66 b	43.33 bcde	1.93 e	84.50 ghij
CYTO-129	22.00 cd	42.43 bcde	3.16 a	134.23 cde
NIAB-78	20.00 cd	26.43 de	2.86 abcd	75.33 hij
L.S.D at 5%	7.54	19.72	0.89	45.08
Genotypes	66.54**	709.07**	0.87**	3787.69**
GCA (testers)	4.60	171.09	0.08	1928.34
GCA (lines)	38.25	1250.98**	1.81**	3299.34**
SCA	13.28	447.14**	0.55	3358.22**

**Significant at 1% level of probability.

Table 2. Estimates of General and Specific Combining ability effects.

Parents		Boll number	Seed cotton yield (gms)
LINES			
S-12		+3.82	+18.54
CRIS-7A		-5.95	+7.76
BH-36		+11.60	+4.46
CIM-240		+8.05	-8.44
NH-26		-17.50	-29.31
S.E.		±3.98	±9.11
TESTERS			
CRIS-52		-2.48	-11.80
CYTO-129		+3.85	+10.71
NIAB-78		-1.35	+1.16
S.E.		±3.08	±7.05
CROSSES			
S-12	x CRIS-52	+21.72	+43.86
S-12	x CYTO-129	-11.62	-34.26
S-12	x NIAB-78	-10.09	-9.58
CRIS-7A	x CRIS-52	+0.15	-5.06
CRIS-7A	x CYTO-129	-3.52	-17.11
CRIS-7A	x NIAB-78	+3.35	+32.17
BH-36	x CRIS-52	+0.73	-11.82
BH-36	x CYTO-129	+2.25	+40.82
BH-36	x NIAB-78	-1.34	-29.00
CIM-240	x CRIS-52	-12.85	-22.09
CIM-240	x CYTO-129	+12.48	+29.15
CIM-240	x NIAB-78	+0.35	-7.06
NH-26	x CRIS-52	-8.29	-4.88
NH-26	x CYTO-129	+0.37	-18.60
NH-26	x NIAB-78	+7.91	+13.93
S.E.		±6.90	±15.78

Results and Discussion

Mean square was highly significant for sympodia, boll number, boll weight and seed cotton yield (Table 1). Variance due to GCA (testers) was non-significant for all the traits while variance due to GCA (lines) were highly significant for all the characters except sympodia. SCA mean squares were highly significant for number of boll and seed cotton yield per plant. Moreover, it is noticed that variances due to GCA were more important than variances due to SCA for all the characters except seed cotton yield, suggesting predominance of additive gene action for number of bolls and boll weight and non-additive for seed cotton yield. The present results are in agreement with the findings of Khan *et al.*, (1990), Rahman *et al.*, (1991), Khan & Ghafoor (1991) and Tang Bing *et al.*, (1993).

Combining ability effects: In number of bolls, highly significant GCA values were displayed by cultivars BH-36, CIM-240 and CYTO-129 (Table 2). While framing the strategy for future breeding programme these varieties should be taken into consideration because the character boll number per plant is one of the main yield component. The SCA effects were highly significant in hybrids viz., S-12 x CRIS-52, CIM-240 x CYTO-129 and NH-26 x NIAB-78, which indicated the presence of non-allelic genes. Present results are in conformity with the findings of Khan *et al.*, (1990), Rahman *et al.*, (1991), Khan & Ghafoor (1991) and Tang Bing *et al.*, (1993). Parents S-12 and CYTO-129 exhibited highly significant GCA effects for the character of seed cotton yield and proved to be good general combiners. Four out of 15 hybrids manifested highly significant SCA values indicating that the character was influenced by non-allelic gene effects. Most of the superior hybrids combination involve atleast one general combining parent with respect to yield per plant. The parents which are good combiner for yield are also good combiner for atleast one or more yield components. In the present study hybrid CRIS-7A and NIAB-78 manifested highly significant SCA values contrary to the above hypothesis which may be due to non-allelic gene action.

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