

VARIABILITY AND CHARACTER ASSOCIATION IN COTTON UNDER NATURAL BOLLWORM INFESTATION

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ABSTRACT

To assess the extent of variability, heritability, genetic advance present in 45 F_1 's and their 10 parents a study was undertaken at the Regional Agricultural Research Station (RARS), Lam, both under protected and unprotected environments. The PCV, GCV heritability and genetic advance values were comparatively high for seed cotton yield and number of bolls per plant indicating the operation of additive gene action. The correlation analysis indicated that number of bolls, sympodia and plant height had significant, positive correlation with seed cotton yield in both the environments. Due weightage may be given to these characters while developing high yielding varieties / hybrids with built in resistance to bollworms.

KEY WORDS : Genetic Variability, heritability, genetic advance, bollworms correlation analysis

Host plant resistance is considered as one of the sound approaches of managing insect pests. In cotton, insecticides have always dominated the pest control scenario. Because of over reliance on insecticides, the cultivation of cotton has become risk prone in Andhra Pradesh. This had led to the recent outbreaks of several major pests. Therefore, a study was undertaken to find out variability and character association both under protected and unprotected environments for the control of insect pests and to develop varieties/hybrids for integrated pest management system.

MATERIALS AND METHODS

Ten diverse parents which are having one or more special attribute for bollworm tolerance were crossed in a diallel fashion (excluding reciprocals) during 1992-93 and 45 crosses were made. The 45 crosses along with 10 parents were grown in randomised block design with two replications during 1993-94 *Kharif* at RARS, Lam. Each entry had single row of ten plants spaced at 120 x 60 cm apart. Five competitive plants from each entry were randomly selected in each replication and observations recorded for seed cotton yield per plant (g), days to 50% flowering, number of monopodia, number of sympodia, plant height (cm), ginning percentage, boll weight (g), number of bolls per plant, number of locules per boll, number of seeds per boll, seed index (g), lint index (g), open boll and loculi damage. GCV, PCV heritability (BS) and genetic advance and the

genotypic correlation co-efficients were computed as per the conventional procedures.

RESULTS AND DISCUSSION

The analysis of variance revealed significant differences among genotypes for the characters under study. The GCV and PCV were comparatively high for number of monopodia, bolls per plant and seed cotton yield and relatively low for other characters both under protected and unprotected conditions (Table 1). The magnitude of these values were higher in protected condition which may be due to insect pest control. Under both the environments, high heritability values were recorded for seed cotton yield per plant, boll weight and number of bolls per plant. Rao *et al.*, (1991) also observed wider variability, higher heritability and genetic advance for number of bolls / plant and seed cotton yield.

A high estimate of heritability together with high genetic advance as per cent of mean was recorded for seed cotton yield, number of bolls per plant and monopodia revealing the influence of additive gene action. Hence, the improvement of these traits can be made through direct phenotypic selection. Johnson *et al.*, (1955) suggested that heritability estimates along with genetic advance would be more useful in predicting yield under phenotypic selection than heritability estimates alone. High heritability is always not an indication of high genetic gain (Swarup and Chagle, 1962).

Table 1. Estimates of GCV, PCV; Heritability (BS), genetic advance and genetic advance as percent of mean in cotton under protected and unprotected environment

Characters		PCV	GCV	Heritability (B.S)	Genetic advance	Genetic advance as percent of mean
Days to 50% flowering	UP	5.27	4.70	79.60	4.69	8.64
	P	5.12	4.90	91.45	5.26	9.65
Monopodia/Plant	UP	25.46	22.80	80.29	0.77	42.11
	P	32.52	29.55	82.55	0.97	55.31
Sympodia/Plant	UP	10.05	8.54	72.17	2.86	14.95
	P	9.51	8.31	76.43	21.68	14.97
Plant height	UP	11.02	9.64	76.56	21.68	17.38
	P	15.46	13.77	79.29	27.94	25.25
G.P	UP	5.65	2.85	25.45	1.00	2.96
	P	4.18	3.26	60.75	1.76	5.23
Boll weight	UP	12.15	11.95	96.76	1.10	24.21
	P	10.88	10.48	92.72	0.89	20.78
Bolls/Plant	UP	32.30	31.46	94.88	8.83	63.13
	P	45.22	44.54	97.01	18.86	90.37
Locs/Boll	UP	3.86	1.95	25.50	0.08	2.03
	P	3.08	1.15	13.88	0.04	0.88
Seeds/Boll	UP	5.86	5.13	76.49	2.73	9.23
	P	4.45	3.35	56.94	2.73	9.23
Seed index	UP	13.16	8.87	45.38	1.13	12.31
	P	7.79	6.12	61.84	0.90	9.92
Lint index	UP	11.12	10.25	85.00	0.92	19.47
	P	8.63	8.12	88.54	0.70	15.73
OBD	UP	9.57	8.19	73.23	7.42	14.44
	P	11.40	10.25	80.90	7.94	19.00
OLD	UP	8.47	6.82	64.74	4.06	11.30
	P	11.16	9.91	78.87	6.66	18.14
Seed Cotton yield	UP	31.85	31.17	95.81	34.93	62.85
	P	44.92	44.37	97.56	70.31	90.28

UP : Unprotected P : Protected OBD : Open boll damage OLD : Open locule damage

Characters which showed high heritability coupled with wider variability would be successfully improved by direct selection (Paul, 1978). For boll weight the high heritability estimate was not accompanied by high genetic advance in both the environments indicating non additive gene action and breeding methods to exploit non additive gene action like heterosis breeding may be tried. For ginning percentage, wide variation between heritability values were observed under these environments. This could be due to insect pest attack.

A knowledge on the association of yield components, bollworms incidence with yield is of paramount important while aiming at improvement in yield with inbuilt resistance to bollworms. Unfavourable associations between the desired attributes under selection may result in genetic slippage and limit genetic advance. The magnitude

of correlation values (Table 2) differed between protected and unprotected environment. In general, these values were high in protected environment than in unprotected. Some character combinations had a high range of correlation values between these two environments.

Both under protected and unprotected conditions, number of bolls had strong correlation with seed cotton yield. Other character showing significant positive correlation with seed cotton yield were number of sympodia and plant height. The character combinations number of monopodia vs seed cotton yield, seeds per boll vs seed cotton yield, GP vs seed cotton yield were having significant correlation under protected condition and were non significant under unprotected condition and *vice-versa* in case of boll weight vs seed cotton yield, seed index Vs seed cotton yield, OBD vs seed cotton yield and OLD vs seed cotton

Table 2. Genotypic correlation coefficients between different characters in cotton under protected and unprotected environment

Character		X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	S.C.Y
X1 days to 50% flowering	UP	0.390**	-0.007	0.070	0.057	-0.531**	0.041	-0.076	-0.250	-0.049**	0.508**	0.279*	0.390**	-0.182
	P	0.440**	-0.206	0.070	0.174	-0.472**	0.399**	-0.277*	0.045	-0.478**	-0.408**	0.129	0.440**	0.261
X2 no of monopodia	UP		0.159	0.077	-0.296*	-0.325*	0.293*	-0.021	-0.224	-0.191	-0.369**	-0.181	-0.227	0.153
	P		0.087	0.326*	-0.146	-0.273*	0.565**	-0.106	0.274*	-0.206	0.388**	0.125	0.148	0.445**
X3 no of sympodia	UP			0.391**	-0.208	0.074	0.340*	-0.038	-0.028	0.146	0.029	-0.242	-0.316*	0.384**
	P			0.403**	-0.420**	0.304*	0.453**	-0.185	0.453**	-0.319*	0.046	0.111	-0.090	0.533**
X4 plant height	UP				-0.133	-0.200	0.495**	0.059	0.178	0.134	0.099	0.042	-0.093	0.562**
	P				-0.634**	0.156	0.734**	-0.102	0.270*	0.229	-0.188	-0.162	-0.186	0.767**
X5 G.P.	UP					0.169	-0.217	0.075	0.326*	0.096	0.181	0.131	0.208	-0.155
	P					-0.199	-0.438*	0.079	-0.313*	-0.412*	0.147	-0.081	-0.069	-0.482**
X6 boll height	UP						0.120	0.330*	0.631*	0.552**	0.761**	-0.086	-0.218	0.319*
	P						-0.123	-0.828**	0.606**	0.850	0.746	-0.189	-0.321*	0.137
X7 boll/plant	UP							-0.030	-0.018	0.083	-0.113	-0.249	-0.357**	0.886**
	P							-0.277*	0.194	-0.100	-0.401**	-0.146	0.133	0.959**
X8 locs/bolls	UP								0.309*	0.024	0.158	-0.002	0.131	0.093
	P								0.462**	0.710**	0.816**	0.096	0.041	-0.104
X9 seeds/bolls	UP									0.150	0.373**	0.003	-0.119	0.258
	P									0.445**	0.278*	-0.014	0.140	0.347**
X10 seed index	UP										0.564**	-0.059	0.125	0.309*
	P										0.745**	-0.066	-0.216	0.112
X11 lint index	UP											0.014	0.082	-0.211
	P											-0.043	-0.162	-0.211
X12 OBD	UP												0.900**	-0.305*
	P												0.954**	-0.190
X13 OLD	UP													-0.458**
	P													-0.207

UP : Unprotected P : Protected OBD : Open boll damage OLD : Open locule damage * : Significant at 5% ** Significant at 1% SCY : Seed cotton yield

yield. Rao *et al.* (1994) also observed strong positive correlation for number of bolls and plant height with seed cotton yield under protected and unprotected environment. They also observed high degree of correlation of plant height with seed cotton yield in protected condition was mainly through number of bolls and sympodia. But in the present study it was observed in both the environments. This could be due to differential reaction of the genotypes studied.

Thus from the correlation study it can be inferred that number of bolls, number of sympodia and plant height had influenced on seed cotton yield and in the improvement program due importance for these traits may be given while developing bollworm tolerant lines.

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