The Andhra Agric. J 57(3):295-297, 2010

Genetic Variability, Heritability and Genetic Advance in Upland Cotton (*Gossypium hirsutum* L.)

Key words : Heritability, Upland Cotton, Variability

Upland cotton (*Gossypium hirsutum* L.) is a predominant species of cotton cultivated mainly for its lint in more than eighty countries of the world. By virtue of its wider adaptability it is grown in irrigated as well as rainfed conditions in India occupying about 75 per cent of the total cotton area of the country with a contribution of 85 per cent to the national production. High heritability together with high genetic advance would bring out the progress expected from selection (Johnson *et al.,* 1955). Therefore, the present study was undertaken to find the genetic variability, heritability and genetic advance of various yield components and quality parameters to improve the yield of cotton.

The experiment was conducted during *kharif* 2004-05 at Instructional Farm, College of Agriculture, Indira Gandhi Agricultural University, Raipur (C.G). Twenty nine upland cotton genotypes, obtained from Central Institute for Cotton Research (CICR), Nagpur, were sown in randomized complete block design (RCBD) with three replications. Data wererecorded on nineteen characters for yield and quality components. The genotypic coefficient of variation (GCV), phenotypic coefficient of variability, heritability in broad sense and genetic advance were estimated as per Singh and Choudhary (1977).

Analysis of variance indicated highly significant differences among the genotypes all the characters indicating existence of sufficient amount of variability in the material. The phenotypic coefficient of variation (PCV) was slightly higher in magnitude than genotypic coefficient of variation (GCV) for all the characters (Table) indicating the influence of environment. Among the different yield attributing and quality components the estimates of GCV and PCV were observed to be highest for number of monopodia plant^{-1} (53.21 and 55.43%, respectively). As also reported by Girase and Mehetre (2002). However, high GCV and PCV were observed only for seed cotton yield plant^{-1} (30.04 and 33.52 %, respectively). High GCV and PCV for seed cotton yield were also reported by Kapoor and Kaushik (2003) and Dheva and Potdukhe (2002). Values for GCV and PCV were found moderate for rest of the characters except fibre strength (8.95 and 8.82 %, respectively), elongation per cent (7.84 and 6.75 %), lint per cent (6.41 and 6.25 %), boll girth (6.39 and 5.42 %), boll length (5.18 and 4.38 %), days to 50 per cent boll opening (4.03 and 3.64 %) and days to 50 per cent flowering (3.70and 2.73 %, respectively).

Heritability estimates in broad sense were relatively higher for almost all the characters (Table). The highest estimate of heritability was recorded for 2.5 per cent span length (98 %) as also reported by Deshmukh *et al.,* (1999). High heritability estimates were also observed for number of seeds boll^{-1} (97 %), fibre strength (97 %), lint per cent (95 %), fibre fineness (95 %), number of monopodia plant^{-1} (93 %), plant height (84 %), days to 50 per cent boll opening (82 %), seed weight boll^{-1} (81 %), seed cotton yield plant^{-1} (80 %), boll weight (79 %), lint index (79 %), lint weight / boll (76 %), elongation (74 %), seed index (73 %), boll girth (72 %) and boll length (71 %) except number of sympodia (67 %) and days to 50 per cent flowering (54 %) which exhibited moderate estimates of heritability (50-70 %), in accordance with Deshmukh *et al.,* (1999) for fibre strength; Li (1994) and Pandey *et al.,* (1995) for lint per cent; Kapoor and Kaushik (2003) for number of monopodia plant^{-1} Deshmukh *et al.,* (1999), for plant height and seed cotton yield plant^{-1} and Kapoor and Kaushik (2003) for boll weight. Similar results for lint index and seed index were also reported by Deshmukh *et al.,* (1999). Whereas, high heritability for seed index was reported by Dheva and Potdukhe (2002). These findings of high heritability indicated that environmental effects had less influence on these characters and additive gene effects were substantially contributing for these traits. Hence selection for these traits would be helpful for improvement in seed cotton yield.

It is evident from the present finding that genetic advance (GA) did not follow the pattern of heritability for all the characters except seed cotton yield plant^{-1} (46.54 %) and plant height (30.17 %), which were high in magnitude and for rest of the characters it exhibited low magnitude (Table). The high genetic advance for seed cotton yield plant^{-1} was also reported by Deshmukh *et al., (*1999), Singh *et al.,*

Table. Mean performance and genetic parameters of yield and quality components of cotton

Characters	Mean	Range		GCV (%)	PCV (%)	h^2_{bs}	GA as % of Mean
		Min.	Max.				
Days to 50 per cent flowering	79.38	76.67	88.67	2.73	3.70	0.54	3.30
Days to 50 per cent boll opening	110.46	103.00	121.33	3.64	4.03	0.82	7.49
Plant height (cm)	120.79	84.27	148.73	13.19	14.36	0.84	30.17
Number of sympodia plant^{-1}	18.35	13.93	26.73	14.73	18.04	0.67	4.55
Number of monopodia plant^{-1}	1.33	0.40	3.33	53.31	55.43	0.93	1.41
Lint weight (g)	1.63	1.13	2.25	14.62	16.80	0.76	0.43
Seed weight (g)	2.44	1.64	3.25	17.43	19.42	0.81	0.79
Number of seeds boll^{-1}	29.23	24.33	38.25	11.36	11.54	0.97	6.79
Boll weight (g)	5.19	3.41	6.64	14.40	16.19	0.79	1.37
Lint index (g)	5.61	4.61	7.60	12.64	14.20	0.79	1.30
Seed index (g)	8.65	6.43	11.28	11.89	13.96	0.73	1.80
Lint per cent	39.70	34.79	44.92	6.25	6.41	0.95	4.99
Boll length (cm)	5.64	5.08	6.18	4.38	5.18	0.71	0.43
Boll girth (cm)	10.06	8.96	11.12	5.42	6.39	0.72	0.95
2.5 per cent span length (mm)	27.09	20.30	33.40	10.32	10.41	0.98	5.71
Elongation (%)	4.83	4.10	5.70	6.75	7.84	0.74	0.58
Fibre fineness (micronaire)	4.10	2.90	5.40	13.63	13.98	0.95	1.12
Fibre strength (g / tex)	22.04	18.00	26.20	8.82	8.95	0.97	3.95
Seed cotton yield plant^{-1} (g)	83.91	41.53	157.33	30.04	33.52	0.80	46.54

Note: GCV: Genotypic coefficient of variation; PCV: Phenotypic coefficient of variation; h^2bs: Heritability in broad sense; GA: Genetic advance; Min: Minimum; Max: Maximum.

(1987), Kapoor and Kaushik (2003) and Girase and Mehetre (2002).

High heritability estimates coupled with high genetic advance was recorded for seed cotton yield plant^{-1} and plant height, in agreement with Deshmukh *et al.,* (1999), Girase and Mehetre (2002) and Kapoor and Kaushik (2003) for both the traits; Dheva and Potdukhe (2002) for seed cotton yield and Choudhary *et al.,* (1988) for plant height. The heritability may be due to additive gene effect and selection may be effective. Johson *et al.,* (1955) suggested that effectiveness of selection depends upon heritability but heritability itself is not a true measure of genetic advance.

Thus, in the present investigation considering variability, heritability and genetic advance, seed cotton yield plant^{-1}, and to some extent plant height may be the best reliable traits that would be exploited through hybridization and selection, since these characters recorded high magnitude for variability parameters.

LITERATURE CITED

Choudhary P N, Borole D N, Patil S D and Narkhede B N 1988. Path analysis in desi cotton. Jouranla of Maharashtra Agricultural Universities 13: 54-55.

Deshmukh V V, Mohad M V, Pande M K and Golhar S R 1999. Variability, heritability and genetic advance in upland cotton (*Gossypium hirsutum* L.). PKV Research Journal 23(1): 21-23.

Dheva N G and Potdukhe N R 2002. Studies on variability and correlations in upland cotton for yield and its components. Journal Indian Society Cotton Improvement 25 (1): 148-152.

Girase V S and Mehetre S S 2002. Variability, heritability and genetic advance studies in cotton (*Gossypium hirsutum* L.). Journal of Cotton Research and Development 6 (11): 81-82.

Johnson H W, Robinson H F and Comstock R E 1955. Estimates of genetic and environmental variation in soybean. Agronomy Journal 47: 314-318.

Kapoor C J and Kaushik S K 2003. Variability, heritability and genetic advance studies in cotton (Gossypium hirsutum L.). Journal of Cotton Research and Development 17 (2): 240-241.

Li W H 1994. Study on genetic variability in early maturing germplasm resources of upland cotton. Crop Genetic Resources 4: 16-18.

Pandey S C, Saxena M K and Julka M K 1995. Studies on genetic variability in upland cotton (*Gossypium hirsutum* L.). Crop Research (Hissar) 10 (3): 273-278.

Singh R K and Chaudhary B D 1977. Biometrical Methods in Quantitative Genetic Analysis. Kalyani Publishers, New Delhi. pp: 1-266.

Singh V V, Singh P and Bhatt M G 1987. Study of yield components in rainfed American cotton. Journal of Indian Society of Cotton Improvement 12: 1-4.

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(Received on 04.08.2008 and revised on 23.03.2010)