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INVESTIGATION ON GENETICS OF NEPPINESS AND STICKINESS OF FIBRES IN TETRAPLOID COTTON FIBRES

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ABSTRACT

The results on neppiness and stickiness of cotton fibres in two groups *i.e.*, 28 intra - *hirsutum* L. and 35 interspecific (*G. hirsutum* L. x *G. barbadense* L.) hybrids have been reported. Neps are small entangled cluster of fibres and one of the major causes for neppinss was high in *G. barbadense* parents compared to *G. hirsutum* lines. It was very high in interspecific hybrids than the intra-*hirsutum* hybrids. Seventeen intra-*hirsutum* and 18 interspecific crosses exhibited a desirable negative *sca* effect for this trait. Few hybrids displayed negative heterosis in both groups. The parents and hybrids of the both groups showed either a little or no stickiness in their fibres.

KEY WORDS : Neppiness, stickiness of fibres, heterosis, intra- *hirsutum*, *Gossypium barbadense*

Neps are small clusters of knotted fibres which are generally immature or dead. Neps lead to lowering of fibre quality which results in undyed or lighted dyed uneven spots in dyed cotton goods. Neps could be caused when the fibres show sticking tendency. This fibre stickiness is attributed to factors such as honey dew contamination, seed coat and seed fragments, highly immature fibres, fine leaf trash particles and more wax in cotton. (Balasubramanian, 1988). Hence the present study was undertaken to investigate the genetics of neps and stickiness in tetraploid cotton hybrids.

MATERIALS AND METHODS

The experimental material consisted of 11 *G. hirsutum* and 5 *G. barbadense* genotypes with diverse origin. Twenty eight intra-hirsutum (7x4) and 35 interspecific (7x5) hybrids were obtained by adopting a 'line x tester' design. These hybrids were raised along with their parents as separate groups in a randomised block design, each group replicated four times at the Cotton Breeding Station, Tamil Nadu Agricultural University, Coimbatore during summer 1995. Each entry was accomodated in a single row of 4.5m with a spacing of 90cm between rows and 45cm between plants.

At random, five plants from each row were selected. From each plant, five bolls were picked and plantwise, samples were ginned and one g of lint was used to make observation on neps and stickiness of fibres. The number of neps were counted manually in one g of lint. The samples were then used for detection of stickiness by adopting Benedict's test and the extent of contamination was graded from 0-3 for the colour changes indicated by Balasubramanian (1988). The data on neppiness and stickiness of fibres were utilised for studying the mean performance of the parents and hybrids, combining ability effects and heterosis over mid parent, better parent and standard check (Savitha and TCHB 213 respectively).

RESULTS AND DISCUSSIONS

The mean performance of the parents of intra-*hirsutum* hybrids for neppiness and stickiness of fibre is presented in Table 1. for the parents of interspecific hybrids in Table 2 and for the hybrids in Table 3.

Table 1. Mean performance for neppiness (Nep) and stickiness of fibres (St.F) in the parents of intra-*hirsutum* hybrids

Lines	Mean Performance		Testers	Mean Performance	
	Nep. (No. /g of lint)	St.F. (grade)		Nep. (No. /g of lint)	St.F. (grade)
H9	18.00	0 (0.71)	H5	15.00	0 (0.71)
H10	22.00	0 (0.71)	H8	22.00	0 (0.71)
H11	20.00	0 (0.71)	H12	19.00	0 (0.71)
H13	10.00	0 (0.71)	HL34	17.00	0.5 (0.97)
H16	12.00	0 (0.71)			
H19	14.00	0 (0.71)			
H22	14.00	0.25 (0.84)			
Mean	15.71	0.04 (0.73)	Mean	18.25	0.13 (0.77)

Table 2. Mean performance for neppiness (Nep.) and stickiness of fibres (St.F) in the parents of interspecific hybrids

Lines	Mean Performance		Testers	Mean Performance	
	Nep. (No. /g of lint)	St.F. (grade)		Nep. (No. /g of lint)	St.F. (grade)
H8	27.05	0 (0.71)	B1	75.12	0 (0.71)
H9	38.00	0 (0.71)	B10	104.00	0 (0.71)
H10	39.27	0 (0.71)	B12	109.65	0 (0.71)
H11	46.57	0 (0.71)	BT1	131.23	0 (0.71)
H12	41.38	0 (0.71)	BT2	106.43	0.5 (0.97)
H13	29.45	0 (0.71)			
H16	46.32	0 (0.71)			
Mean	38.29	0 (0.71)	Mean	105.28	0.1 (0.76)

Number in parantheses indicates square root transformed values

Neppiness ranged from 10.00 in H13 to 22.00 in H10 among the lines (mean 15.71) and from 15.00 in H5 to 22.00 in H8 (mean 18.25) among the testers. The mean value of the hybrids was lesser than the parental mean (Table 3). In case of interspecific hybrids, the *G. hirsutum* lines showed a mean of 38.29 neps while the *G. barbadense* testers exhibited a very high mean of 105.28 neps indicating the importance of *G. barbadense* genotypes for their contribution to this trait. The mean nep count in the interspecific hybrid was very high (117.05) surpassing the parental means. Fibre stickiness was observed only in few genotypes such as H22, HL34 and BT2 used in the study. The hybrids of both groups showed no variation in their mean values for this trait.

Table 3. Mean performance for neppiness (Nep.) and stickiness of fibres (St.F.) in intra - *hirsutum* and interspecific

Groups	Nep. (No. /g of lint)	St.F. (grade)
Intra-hirsutum	12.66	0.11 (0.78)
G. hirsutum x G. barbadense	117.05	0.11 (0.78)

Numbers in parantheses indicate square root transformed values

Table 4. *gca* effects of parents and *sca* effects of hybrids for Neppiness

Lines / Testers	*sca* effects of hybrids							*gca* effects of testers
	H9	H10	H11	H13	H16	H19	H22	
Intra-hirsutum hybrids								
H5	-1.80**	-6.05**	2.70**	2.10**	-1.43**	6.95**	-3.05**	5.05**
H8	10.91**	6.66*	-4.59**	-5.59**	1.29**	-2.34**	-6.34**	0.34*
H12	-0.73*	-0.98**	-2.23**	-1.23**	-2.86**	-3.98**	12.02**	- 3.02**
HL34	-8.38**	0.38	4.13**	4.13**	3.00**	-0.63**	-2.63**	- 2.38**
gca effects of lines	1.09**	4.34**	-2.41**	-4.41**	2.71**	1.34**	-2.66**	
SE (lines) : 0.16				SE (testers) : 0.19			SE (hybrids) : 0.42	

Lines / Testers	*sca* effects of hybrids							*gca* effects of testers
	H8	H9	H10	H11	H12	H13	H16	
Interspecific hybrids								
B1	37.09**	10.15**	29.70**	11.57**	-6.30**	-53.21**	- 28.99**	11.51**
B10	15.63**	0.81**	14.36**	10.16**	-4.76**	-6.27**	1.32**	- 14.80**
B12	-7.14**	-5.98**	-7.75**	-13.38**	13.60**	14.86**	5.81**	-6.01**
BT1	-49.48**	-3.27**	-7.94**	-4.39**	5.66**	26.23**	33.20**	-0.23
BT2	35.16**	-1.70**	-28.37**	-3.95**	-8.20**	18.39**	- 11.34**	9.53**
gca effects of lines	-0.84**	3.37**	-6.61**	8.42**	- 15.56**	8.25**	2.96**	
SE (lines) : 0.12				SE (testers) : 0.15			SE (hybrids) : 0.31	

* Significant at 5% level ** Significant at 1% level

Table 5. *gca* effects of parents and *sca* effects of Intra-hirsutum hybrids for stickiness of fibres (grade)

Lines / Testers	sca effects of hybrids							gca effects of testers
	H9	H10	H11	H13	H16	H19	H22	
H5	0.01	-2.23**	-0.10*	0.01	-0.06	0.37**	0.01	0.01
H8	-0.02	-0.24**	0.26**	-0.02	0.18**	-0.15**	-0.02	0.02
H12	0.01	0.28**	-0.10*	0.01	-0.06	-0.13**	0.01	0.01
HL34	0.02	0.18**	-0.08	0.02	-0.05	-0.12	0.02	-0.02
gca effects of lines	-0.07**	0.15**	0.02	-0.07**	-0.01	0.06**	-0.07**	
SE (lines) : 0.08				SE (testers) : 0.10			SE (hybrids) : 0.22	

* Significant at 5% level ** Significant at 1% level

In the intra-*hirsutum* crosses, the lines H11, H13 and H22 and the testers H12, and HL34 showed negative *gca*. (Table 4). In interspecific hybrids, three lines *viz.*, H8, H10 and H12 and two testers *viz.*, B10 and B12 displayed negative *gca* effect. Seventeen intra-*hirsutum* and eighteen interspecific hybrids exhibited negative *sca* effect.

The hybrids exhibiting *sca* effects, in the negative direction and their respective parents with negative *gca* effect will be a more reliable combination for this trait. Such a situation was evidenced in case of intra-*hirsutum* hybrids, H11xH12, H13xH12 and H22xHL34 and in the interspecific hybrids, *viz.*, H8xB12, H10xB12 and H12xB10. These hybrids show the feasibility of further improvement for low neppiness in breeding program. Importance in selection for few neps in high yielding hybrids has been stressed by Basu (1983).

Three lines *viz.*, H9, H13, and H22 showed negative *gca* effects for this trait but these lines proved to be poor specific combiners in combination with all the testers (Table 5). None of the testers were good general combiners for this trait. The hybrids H10xH5, H10xH8, H19xH12, H19xHL34 showed negative *sca* effect with their female parent possessing significant and positive *gca* while their tester parent showed a nonsignificant *gca*. Such absence of relationship between the *gca* effects of the parents and the *sca* effects of the crosses revealed the influence of epistatic gene action controlling this trait.

Expression of high negative heterosis by the hybrids for these traits is a rewarding feature in breeding for fibre quality improvement (Table 6). In *G. hirsutum* crosses, relative heterosis in the hybrids ranged from 84.62% in H11xH12 to 37.14% in H11xH5. Eighteen hybrids exhibited negative relative heterosis while twenty one expressed negative heterobeltiosis. Heterosis of the hybrids over the standard check (Savitha) ranged from -66.67% in H19xH8 to 188.89% in H10xH8. Eight hybrids showed negative standard heterosis. In case of *G. hirsutum x G. barbadense* crosses, H12xB10 was the only hybrid to display negative relative heterosis. Heterobeltiosis ranged from -36.06% in H12xB10 to 59.47% in H12xB1. Twenty eight hybrids exhibited negative heterosis over the standard check (TCHB 213). All the hybrids involving the tester BT2 showed negative standard heterosis for neppiness. Only eight intra-*hirsutum* hybrids exhibited negative relative heterosis and heterobeltiosis (Table 7). Stickiness of fibres showed a very low variability and the hybrids were mostly similar to their parents displaying either slight or no stickiness. No interspecific hybrid showed significant negative heterosis for this trait.

The studies on two troublesome fibre properties namely stickiness and neppiness of fibres revealed the possibility of identifying crosses such as H11xH12, H13xH12, H22xHL34 and H12xB10 which showed favourable combination of negative general and specific combining ability coupled with negative heterosis.

REFERENCES

BALASUBRAMANIAN, P. (1988). Stickiness in cotton. J. Textile Assoc., 2: 123 - 125.

Table 6. Heterosis for Neppiness

Testers / Lines	H5			H8			H12			HL34		
	di	dii	diii	di	dii	diii	di	dii	diii	di	dii	diii
Intra-hirsutum hybrids												
H9	3.03	-5.56*	88.89**	-20.00**	-27.77**	77.78**	-2.70	-5.26*	100.00**	-8.57**	-11.11**	77.78**
H10	2.70	-13.64	111.11**	18.18**	0.00	188.89**	-41.46**	-45.45	33.33**	28.21**	13.64	177.78**
H11	37.14**	20.00**	166.67**	-71.43**	-72.73**	-33.33**	-84.62**	-85.00**	-66.67*	-8.11***	-15.00	88.89**
H13	-4.00	-20.00**	33.33**	-75.00**	-81.82**	-55.56**	-31.03**	-47.37**	11.11**	-3.70	-23.53**	44.44**
H16	-62.96**	-66.67**	-44.44**	-76.47**	-81.82**	-55.56**	-38.71**	-50.00**	5.56**	-51.72**	-58.82**	-22.22**
H19	31.03**	26.67**	111.11**	-83.33**	-86.36**	-66.67**	-9.09**	-21.05**	66.67**	-22.58**	-29.41**	33.33**
H22	-31.03**	-33.33**	11.11**	-11.11**	-27.27**	88.89**	33.33*	-42.11**	22.22**	-67.74**	-70.59**	-44.44**

Testers / Lines	B1			B10			B12			BT1			BT2		
	di	dii	diii	di	dii	diii	di	dii	diii	di	dii	diii	di	dii	diii
Interspecific hybrids															
H8	222.58**	119.37**	10.42**	116.83**	36.61**	-4.80**	121.87**	38.30**	1.61**	87.71**	13.20**	-0.47**	59.88**	0.26	-28.51**
H9	47.80**	11.28**	-43.99**	44.40**	-1.42**	31.3*	16.19**	-21.77**	-42.52**	25.78**	-18.90**	-28.70**	52.33**	3.36**	-26.30**
H10	111.23**	60.83**	-19.05**	14.36**	-21.23**	-45.10**	39.97**	-4.95**	-30.16**	24.96**	-18.82**	-28.62**	41.46**	-3.17**	-30.95**
H11	78.18**	44.33**	-27.35**	28.41**	-7.04**	-35.22**	35.80**	-3.26**	-28.93**	22.69**	-16.88**	-26.92**	75.36**	26.05**	-10.12**
H12	105.67**	59.47**	-19.73**	-8.51**	-36.06**	-55.44**	54.84**	6.63**	-21.67**	18.51**	-22.06**	-31.47**	63.53**	13.55**	-19.03**
H13	104.49**	42.33**	-28.35**	126.75**	45.48**	1.37**	119.95**	39.51**	2.50**	100.28**	22.61**	7.81**	88.78**	20.51**	14.00**
H16	50.84**	21.93**	-38.92**	74.36**	26.01**	-92.59**	31.85**	-6.22**	-31.11**	72.60**	16.77**	2.66**	54.76**	11.06**	20.80**

* Significant at 5% level ** Significant at 1% level

Table 7. Heterosis for stickiness of fibres

Testers	H5			H8			H12			HL34		
Lines	di	dii	diii	di	dii	diii	di	dii	diii	di	dii	diii
Intra-*hirsutum* hybrids												
H9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-15.47*	-26.79**	0.00
H10	0.00	0.00	0.00	73.20**	0.00	71.83**	0.00	0.00	0.00	-15.47*	-26.79**	0.00
H11	0.00	0.00	0.00	54.90**	0.00	54.93**	0.00	0.00	0.00	15.47*	0.00	36.62**
H13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	46.41**	26.79**	71.83**
H16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.47*	-26.79**	0.00
H19	0.00	0.00	0.00	0.00	0.00	0.00	54.90**	0.00	54.93**	15.47*	-26.79**	0.00
H22	-8.38*	-15.47*	0.00	-8.38*	-15.47*	0.00	-8.38*	-15.47*	0.00	-21.54**	-26.79**	0.00

BASU, A.K. (1983). Hybrid cottons and their role in increased cotton production and productivity in India. In : **Genetics of Heterotic System in Crop Plants.** Pre-congress symposium held at School of Genetics, Tamil Nadu Agricultural University, Coimbatore, December 7-9. pp. 172-176.

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QUALITY OF DIFFERENT SOURCES OF IRRIGATION WATER OF JAMMU REGION

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ABSTRACT

Water samples from different sources *viz.*, rivers, streams, nallahs, tube wells and hand pumps in Jammu region were collected and analysed for quality parameters to ascertain their suitability for irrigation purposes. Except some of the tubewell and hand pump water samples which showed higher values of residual sodium carbonate, most of the water sources were observed to be suitable for irrigation purposes.

KEY WORDS : Water quality, irrigation sources, Jammu

Chemical analysis of the water indicates its suitability for irrigation purposes. Rivers, nallahs and streams are the important potential sources of irrigation water in the Jammu region of Jammu and Kashmir State. Besides, tubewells and shallow dug wells also provide an alternative source of irrigation in some parts of the subtropical plains of Jammu. Some cultivated areas in the districts Jammu and Kathua which are mostly flat and possess high water table fall in this category. Farmers also use water from hand pumps, on a very small scale, for irrigating their kitchen gardens, continuous use of bad quality water (having excess of soluble salts in the form of chlorides, sulphate or even borates of sodium or even other cations) can result in salinity or alkalinity in soil which may affect crop yield and its quality. The current study was therefore, planned to ascertain the quality of different sources of irrigation water *viz.*, rivers, streams, nallahs, tubewells and shallow hand pumps in the Jammu region of Jammu and Kashmir State.

MATERIALS AND METHODS

Water samples from 10 rivers, streams and nallahs, 8 tubewells and 16 hand pumps from different places of Jammu region were collected. Sample from rivers, streams and nallahs were collected in the months of November and December when there was normal flow and from tubewell and hand pumps in the month of May and June of the same year. The samples were analysed for different cations (Ca^{++}, Mg^{++}, Na^{+} and K^{+}) and anions (Cl^{-}, $SO4^{-}$, $CO3^{--}$, $HCO3^{-}$) by routine methods. Besides, pH and electrical conductivity were also estimated.