IMPROVEMENT OF *G. ARBOREUM* COTTON FOR FIBRE QUALITY TRAITS VIS-A-VIS SEED COTTON YIELD UNDER NORTH INDIAN CONDITIONS

SK Verma[1], D Monga[1], Anuj Kumar[1] and VN Waghmare[2]

[1]Central Institute for Cotton Research, Regional Station, Sirsa, HARYANA, INDIA.

[2] Central Institute for Cotton Research , Nagpur, INDIA.

- **Cotton – A vital cash crop due to oil and natural fibre**
- **Influences economies - USA, China, India, Pakistan, Uzbekistan, Australia and Africa.**
- **In India, all cultivated (4) species of cotton namely *Gossypium hirsutum*, *G. brabadense*, *G. arboreum* and *G. herbaceum* are grown.**
- ***G. hirsutum* covers more than 90% of acreage while the diploid the least.**
- **However, the diploids are coarser relatively tolerant to insect-pest and diseases and require less inputs as compared to *G. hirsutum*.**
- **Cotton leaf curl disease is prevalent in *G. hirsutum* and no genotype is immune to this disease, however, diploid cotton *G. arboreum* is observed to be immune to this dreaded disease.**
- **The diploid cotton provides an alternative to such situation if it gives remuneration equal to or higher than *G. hirsutum*.**

Genotypes of North India

Name	Place	Year of Release	Seed Cotton Yield (q/ha)	GOT (%)	Fibre length (mm)	MIC	Strength (g/tex)
DS 1	HAU	1985	20.0	39.2	17.0	7.7	-
DS-5	HAU	1989	20.5	40.1	17.5	7.0	-
HD 107	HAU	1996	25.9	38.4	18.6	8.0	-
HD123	HAU	2000	22.9	39.0	14.7	7.0	14.6
HD 324	HAU	2005	18.7	41.6	17.8	7.4	16.4
HD 432	HAU	2010	21.5	39.3	21.2	7.0	17.6
G-27	PAU	1973	10.0	37	16	-	-
LD-327	PAU	1989	20.0	41	16	7.0	-
LD-491	PAU	1996	14.0	39	20	-	-
LD 694	PAU	-	23.28	36.1	20.7	7.1	16.3

Genotypes of North India

Name	Place	Year of Release	Yield potential (q/ha)	GOT (%)	Fibre length (mm)	MIC	Strength (g/tex)
RG-8	RAU, SGN	1988	17.0	39	19	6.9	18.3
RG-18	RAU, SGN	2001	24-26	38	-	-	-
RG 542	RAU, SGN	2013	25.8	36.1	21.5	6.8	21
CISA 310	CICR SRS	2010	21.7	36.5	20.2	7.1	15.9
CISA 614	CICR SRS	2010	22.0	36.6	20.9	6.8	16.9

Objective

- **Primary objective - to enhance the fibre yield per unit area and its quality.**
- **Genotypes of north India like HD 123, LD 327, RG 8, CISA 310 etc. are high yielding but coarse.**
- **There is scope to enhance fibre quality vis-à-vis yield under North India.**
- **In Central India long linted cultures like CINA 323B, PA 255, PA 304, DLSA 8, CINA 316, PA 464, DLSA 16 etc. are available.**
- **These cultures are poor yielders under North.**
- **Under TMC MM I programme (2002 onwards) the cultures from Central India were exchanged and a crossing program was initiated.**
- **F1s were having fibre quality traits like Central genotypes.**
- **Later single plant selection was done for seed cotton yield vis-s-vis fibre quality traits.**
- **Single plant progenies were identified.**
- **Evaluated over the years and continuous selection was done.**

Performance - Genotypes of Central India under North

Name	Place	Seed Cotton Yield (q/ha)	GOT (%)	Fibre length (mm)	MIC	Strength (g/tex)
PA 255	Parbhani	538.2	36.8	26.0	5.4	22.1
PA 304	Parbhani	560.3	36.1	26.7	4.8	22.3
PA 464	Parbhani	452.8	34.9	26.0	5.3	20.1
DLSA 8	Dharwad	705.0	34.3	25.5	4.8	22.7
DLSA 16	Dharwad	590.7	34.8	25.9	4.9	21.1
CINA 316	Nagpur	669.0	35.6	23.8	5.0	22.9
CINA 323B	Nagpur	849.8	32.5	25.1	4.9	24.0
LD 327	Ludhiana	1920	35.6	19.2	7.0	17.2
RG 8	Sriganganagar	2034	36.7	19.6	6.9	16.6
CISA 6	Sirsa	2023	36.0	22.8	6.9	17.6

CICR genotypes with good fibre traits

Entry Name	SCY (Kg/ha)	Boll wt (gm)	GOT (%)	UHML (mm)	UI	Strength (g/tex)	MIC
CAN-1052	447.73	1.23	38.7	25.6	81	25.6	4.9
CAN-1053	1661.59	1.33	39.3	26.4	82	27.2	5.4
CAN-1054	1910.35	1.57	30.5	27.3	82	28.0	5.7
CAN-1055	1266.53	1.43	29.1	26.8	82	27.6	5.3
CAN-1056	1350.75	1.37	43.5	28.1	83	28.6	5.4
CAN-1057	1024.90	1.57	33.2	27.0	82	26.8	5.7
CAN-1058	1129.56	1.55	36.6	26.6	82	27.3	5.7
CAN-1059	1601.03	1.47	40.6	26.7	82	26.6	5.7
CAN-1060	1822.90	1.54	35.6	26.3	82	26.6	5.7
CAN-1061	1505.42	1.50	38.6	26.4	82	26.4	5.5
CAN-1062	1476.75	1.41	36.8	26.2	82	26.3	5.8
CAN-1063	1103.70	1.76	37.8	27.2	82	27.1	5.7
CD	216.09						
CV	7.164						

Long linted arboreum cultures

Entry Name	SCY (kg/ha)	Lint Yield (kg/ha)	GOT (%)	Boll wt (g)	UHML (mm)	UI	Strength (g/tex)	MIC
GAM 231	752.64	287.70	38.88	2.3	27.4	82	26.0	5.2
ARBa 1502	1005.86	374.10	37.20	1.9	27.5	82	25.5	5.3
PA 812	616.39	240.37	38.96	1.7	27.1	82	25.5	5.7
DWDa 1502	746.81	286.00	38.30	1.8	28.6	83	27.0	5.4
PA 255 (Quality check)	577.40	225.78	39.10	1.6	26.6	82	26.5	5.8
CISA 614 (Yield check)	2318.95	1036.57	44.70	2.2	21.7	79	22.4	6.5
CD	116.24							
CV	8.22							

Intercrosses

Name	Seed Cotton Yield (q/ha)	Boll wt (gm)	GOT (%)	Fibre length (mm)	MIC	Strength (g/tex)
LD327 x PA 255	1461.1	2.3	34.8	24.1	7.1	18.6
LD327 x CINA-316	737.0	2.7	34.9	25.2	7.0	18.4
RG-8 x CINA316	2586.4	2.7	33.4	25.5	7.2	19.6
RG-8 x PA255	1338.5	3.0	35.9	24.1	7.5	17.2
RG-8 x PA304	1718.8	3.0	30.1	24.8	7.7	17.3
LD327 x DLSA-16	1851.1	2.5	34.9	25.1	7.5	14.2
HD-123 x DLSA-8	1195.1	2.8	35.0	25.3	7.6	17.5
RG-8 x PA304	1574.1	2.6	36.0	24.3	6.8	18.7
DLSA-16 x RG-8	2314.8	2.7	33.5	24.2	7.1	20.4
PA464 x RG-8	2037.0	2.4	33.5	26.4	5.2	21.3
PA304 x LD327	1203.7	2.5	35.5	24.4	6.8	18.3
PA304 x HD123	1481.5	2.0	35.5	24.4	5.3	17.9
CINA323B x HD123	1555.5	2.3	36.5	25.2	6.2	18.2
PA255 x HD123	666.7	2.3	33.5	24.1	6.7	19.3
CISA-310 x PA464	1481.5	2.0	35.5	25.7	6.2	19.3
CISA-33 x PA304	740.7	1.6	34.5	23.6	6.1	19.2
HD-123 (LC)	2086.0	3.2	36.9	20.2	7.0	16.2
RG-8 (LC)	2237.6	2.5	38.0	17.3	7.0	14.8
CV% =12.42	CD (kg/ha) = 194.62					

Mean Performance of improved genotypes over 3 years (2014-16)

Entry	SCY (kg/ha)	LY (kg/ha)	GOT (%)	Boll wt (g)	UHML (mm)	% IOC	UI	Strength (g/tex)	% IOC	MIC	% IOC
CISA 6-350	1,737.6	674.2	38.7	2.0	25.7	26.0	80.7	24.9	18.9	6.7	-4.3
CISA 6-295	1,741.4	653.5	37.4	2.0	26.1	28.0	80.8	25.7	22.4	5.6	-20.0
CISA 6-209	1,657.8	633.3	38.2	2.0	24.4	20.0	80.4	25.1	19.5	5.5	-21.4
CISA 6-256	1,523.8	592.6	38.9	1.9	23.5	15.4	80.5	24.1	14.9	6.6	-5.7
CISA 33-1	1,848.7	712.9	38.7	2.0	24.5	20.3	80.0	23.4	11.4	5.4	-22.9
CISA 33-2	2,221.1	850.0	38.2	1.9	24.3	19.1	79.0	23.4	11.4	6.5	-7.1
CISA 33-3	2,552.1	957.3	37.5	2.0	24.5	20.4	79.9	23.6	12.4	6.6	-5.7
CISA 33-6	1,754.6	655.1	37.2	1.8	25.8	26.7	80.0	24.4	16.2	5.3	-24.3
CISA 33-7	1,736.0	677.6	39.0	2.0	25.3	24.2	80.3	22.8	8.6	5.3	-24.3
CISA 33-8	1,971.6	756.9	38.4	1.9	25.7	26.2	81.1	24.0	14.3	6.0	-14.3
CISA 614	2,348.0	896.6	38.1	2.0	20.4	0.0	77.7	21.0	0.0	7.0	0.0
CD	213.30	141.89									
CV (%)	12.94	13.08									

Genotypic correlation

	SCY (kg/ha)	LY (kg/ha)	GOT (%)	Boll wt (g)	UHML (mm)	UI	Strength (g/tex)	MIC
SCY (kg/ha)								
LY (kg/ha)	0.991**							
GOT (%)	0.879**	0.878**						
Boll wt (g)	0.913**	1.092**	0.867**					
UHML (mm)	-0.651**	-0.698**	-0.093	-0.934**				
UI	-0.821**	-0.871**	0.165	-0.746**	0.822**			
Strength (g/tex)	-0.694**	-0.740**	-0.049	0.737**	0.235	0.655**		
MIC	0.659**	0.718**	0.196	0.225	-0.764**	-0.654**	0.019	

Phenotypic correlation

	SCY (kg/ha)	LY (kg/ha)	GOT (%)	Boll wt (g)	UHML (mm)	UI	Strength (g/tex)	MIC
SCY(kg/ha)								
LY(kg/ha)	0.994**							
GOT (%)	-0.001	0.107						
Boll wt (g)	-0.108	-0.105	0.045					
UHML (mm)	-0.500**	-0.504**	-0.062	-0.093				
UI	-0.506**	-0.495**	0.096	0.117	0.556**			
Strength (g/tex)	-0.454**	-0.448**	0.024	0.186	0.270	0.249		
MIC	0.383*	0.380*	0.012	0.019	-0.614**	-0.433*	0.009	

Path Analysis

	LY (kg/ha)	GOT (%)	Boll wt (g)	UHML (mm)	UI	Strength (g/tex)	MIC	SCY
LY (kg/ha)	1.0053	-0.0116	-0.0003	-0.0008	-0.0016	0.0011	0.0018	0.9938
GOT (%)	0.1071	-0.1089	0.0001	-0.0001	0.0003	-0.0001	0.0001	-0.0014
Boll wt (g)	-0.1056	-0.0050	0.0030	-0.0001	0.0004	-0.0005	0.0001	-0.1076
UHML (mm)	-0.5066	0.0068	-0.0003	0.0015	0.0018	-0.0007	-0.0029	-0.5003
UI	-0.4973	-0.0104	0.0004	0.0008	0.0033	-0.0006	-0.0020	-0.5059
Strength (g/tex)	-0.4508	-0.0026	0.0006	0.0004	0.0008	-0.0024	0.0000	-0.4541
MIC	0.3822	-0.0013	0.0001	-0.0009	-0.0014	0.0000	0.0047	0.3833

Residual error : 0.00062

Summary

	Overall mean	h2	GCV	PCV	GA	GAM
SCY (kg/ha)	1,917.52	57.35	15.01	19.82	448.92	23.41
LY (kg/ha)	732.74	49.61	13.98	19.84	148.58	20.28
GOT (%)	38.21	23.45	1.13	2.32	0.43	1.12
Boll wt (g)	1.95	21.38	0.69	5.89	0.00	0.17
UHML (mm)	24.38	38.37	6.71	7.14	3.17	13.00
UI	80.03	22.93	0.82	1.72	0.65	0.81
Strength (g/tex)	21.67	41.94	12.28	12.80	5.25	24.25
MIC	6.06	38.57	10.62	11.99	1.18	19.40

Performance of CISA-6-214 under AICCIP Trial (Br 22a/b)

Entry	SCY (Kg/ha)	Lint Yield (Kg/ha)	Boll wt (g)	GOT (%)	2.5% span length (mm)	MIC	Strength (g/tex)
CISA-6-214 (10th)	1453.0	557.0	2.3	38.3	25.4	6.2	21.1
(Zonal Check)	2044.0	771.0	2.3	37.5	19.0	7.0	17.8
(Local Check)	2086.0	827.0	2.5	39.6	22.0	6.7	17.5
CD @ 5%	268.67						
CV %	12.17						

Conclusions & Future Thrust

- **Significant improvement in UHML (mm) ranging 15.4 to 28.0%.**
- **Improvement in Bundle strength (g/tex) of 8.6 to 22.4%**
- **Improvement in Fineness ranging -5.7 to -24.3%**
- **Improvement in fibre quality triats vis-à-vis seed cotton yield obtained.**
- **Miles to go for improvement in fibre quality triats vis-à-vis seed cotton yield.**


ThanKS