

Annual 2006 Report  
Cotton Incorporated TSSC Project 04-523TX  
Improving East Texas Cotton - New Alleles for Improved Performance  
Steve Hague and Wayne Smith

## Summary

The Cotton Improvement Lab has released or co-released 106 germplasm lines and two cultivars. The most recent CIL releases were four germplasm lines and one new cultivar in 2005. These were TAM 96WD-18, TAM 96WD-69s, TAM 98D-99ne, and TAM 98D-102. TAM 96WD-18 and TAM 98D-102 have excellent fiber packages and competitive agronomic performance, TAM 96WD-18 has fiber UHM length similar to FiberMax 832 and DPL 491 (the longest commercial upland cultivars) while TAM 98D-102 exhibits fiber bundle strength greater than any currently available commercial types and TAM 96WD-69s is a completely smooth genotype. TAM 98D-99ne carries the nectariless trait in a good agronomic background for central and south Texas (This line has been used by Dr. Bill Meredith as a source of improved strength and nectariless). Tamcot 22 was released as a conventional cultivar but has not been picked up by any seed companies.

Several strains, e.g., TAM 01C-67, D-76, or WR-56, preformed well as an average of six locations in central and south Texas and may be released during 2007. TAM 01E-22 averaged 1.26 UHM and 34.1 g/tex bundle strength over 6 locations in 2007, compared with 1.18 and 31.2 for FM 832. This strain will be released in 2007 provide sufficient seed of sufficient quality. Approximately 20 other strains that were performance tested for the third year in 2007 will be evaluated and decisions will be made in the next couple of months is any prove to be adequate in yield and/or quality for release to other plant breeders as parental material.

Much of our early generation material concentrates on the development of exceptional fiber quality, e.g. material with ELSU (extra long staple upland) backgrounds. Of the F1 entries evaluated in 2006, 43 were combinations made in 2005 with at least one parent an ELSU, 111 with at least one parent having a sea island pedigree, 21 with either *G. tomentosum* or *G. mustilineum* in its recent pedigree, and 57 were developed from medium staple upland x upland parentage. Although reported and discussed under the CI Core project 03-367, the interspecific and the ELSU crosses will feed material into our strategy of strain development within the Cotton Improvement Lab. The 43 F1 populations with ELSU parentage ranged from 1.20 to 1.40 UHM and 29 to 36 g/tex strength; the 111 F1 populations with sea island pedigree ranged as high as 1.34 UHM and 37 g/tex; while the *G. tomentosum* or *mustilineum* F1s ranged up to 1.32 UHM and 37 g/tex. Many of the F1 populations within these groups expressed average or below average fiber length and strength. Other HVI traits were within expected and usually normal ranges across all F1 groups.

## Objectives:

1. Develop cotton germplasm with high yield potential, earliness, and improved fiber and seed quality for Texas
2. Evaluate morphology traits of interest such as smooth leaves and/or stems and subokra leaf shape
3. Phenotypic stability across the diverse environments of Texas
4. Train graduate students.

The Cotton Improvement Lab (CIL) at Texas A&M University is primarily responsible for cotton breeding and genetics for central and south Texas. The lab has breeding activities in Weslaco and College Station, and performance evaluations at seven other locations. The primary goals of the program are to develop new cotton germplasm with higher yield potential, improved fiber quality (previously areas of concentration have been UHM length and fiber bundle strength), resistance to seedling diseases, and resistance to seedling drought. This is accomplished by the application of applied plant breeding techniques to create variability within populations of plants segregating for these and other phenotypic traits. Such material is created each year by combining parental types (up to 300 unique combinations of parents each year), both intra and interspecific crosses, that promise to provide expanded genetic variability in yield potential, desirable plant and boll morphology, fiber quality, and/or resistance to abiotic stress such as drought. Selections are made to produce over 400 new strains each year that are evaluated for yield, quality, and field drought resistance. Collaborative or companion projects supported by Cotton Incorporated Core and Texas State Support are aimed at developing resistance to pests such as the SLW, fleahopper, and pathogens such as the seedling disease complex and nematodes. The CIL primarily develops parental material with genes of interest and benefit to Texas' cotton producers and provides these parental lines to private breeding companies for incorporation into adapted cultivars. New varieties are released occasionally. Graduate student training is an integral part of the CIL's program in order to develop future leaders in the area of plant breeding.

The Cotton Improvement Lab has released or co-released 106 germplasm lines and 2 cultivars. The CIL released four germplasm lines and one new cultivar in 2005. These were TAM 96WD-18, TAM 96WD-69s, TAM 98D-99ne, and TAM 98D-102. TAM 96WD-18 and TAM 98D-102 have excellent fiber packages and competitive agronomic performance, TAM 96WD-18 has fiber UHM length similar to FiberMax 832 and DPL 491 (the longest commercial upland cultivars) while TAM 98D-102 exhibits fiber bundle strength greater than any currently available commercial types and TAM 96WD-69s is a completely smooth genotype. TAM 98D-99ne carries the nectariless trait in a good agronomic background for central and south Texas (This line has been used by Dr. Bill Meredith as a source of improved strength). Tamcot 22 was released as a conventional cultivar.

Much of our 2006 data have not been compiled and analyzed. Of the F1 entries evaluated in 2006, 43 were combinations made in 2005 with at least one parent an ELSU, 111 with at least one parent having a sea island pedigree, 21 with either *G. tomentosum* or *G. mustilineum* in its recent pedigree, and 57 were developed from medium staple

upland x upland parentage. Table 523-1 suggest a considerable range in HVI fiber traits within this material from which to originate segregating progeny and strain selection over the next several years. Although reported and discussed under the CI Core project 03-367, the interspecific and the ELSU crosses will feed material into this strategy of strain development within the Cotton Improvement Lab.

The CIL makes approximately 500 F4 PR field selections each year, about half at Weslaco and half at College Station. These are reselected based on HVI fiber traits. College Station fiber data have not been evaluated to date but 174 Weslaco F4 PRs were selected for field evaluation as F5 progeny rows in 2007. The fiber properties of these are shown in Table 523-2.

Table 523-3 presents a summary of data for several elite strains evaluated in the Central and South Texas Preliminary Variety Trials (PVT) during 2006. Data from individual locations were reported in the CIL's Core report for project 03-367 and thus are not repeated here. These data suggest that several strains are near cultivar level in yield competitiveness but lack environmental stability. For example, TAM 01C-67 probably is the most consistent strain in this group of advanced material with good performance in Uvalde (irrigated), San Patricio County (irrigated), and Dallas (dryland). TAM 01D-76 performed well at College Station but erratically at other locations. TAM 01E-22 obviously is the best performer from an HVI fiber quality perspective and probably will be released as a germplasm during 2007 (Table 523-6).

The CIL's efforts in developing ELS upland strains having yield potential combined with elite fiber quality are demonstrated in Tables 523-4 and 523-5. These data suggest that four ELSU lines, 02 HiL B-182-39, 7, and 10, and 03 HiL B-147-21, yielded as well as FiberMax 832 LL and with improved fiber UHM length. At Thrall in 2006, under severe drought stress, eight ELSU lines yielded as well as the highest check, Stoneville 5599BR, and all had higher UHM lengths and fiber bundle strengths than FiberMax 832 or DPL 491. These data need to be confirmed but are encouraging relative to yield potential of some of the ELSU strains.

Additional efforts continue relative to the creation of new, segregating populations (up to 300 per year) and the evaluation of progeny and strains at up to nine locations in central and south Texas as well as collaboratively in other programs and states. At least one germplasm line is expected to be released in 2007, TAM 01E-22, with improved length and strength.

Table 523-1. Performance Range of 2006 F1 within parentage

Trait	Checks	G.h.x ELSU	G.h.x si	G.h.xG.t/m	G.h.xG.h.
n	3 (24)	43	111	21	57
% lint	36.8 - 41.0	32.3 - 40.1	30.2 - 43.0	32.8 - 40.7	29.4 - 44.6
UHM	1.06 - 1.21	1.20 - 1.40*	1.05 - 1.34**	1.12 - 1.32	1.03 - 1.28
g/tex	25.8 - 33.1	29.4 - 35.8	26.1 - 37.5	27.2 - 34.4	25.0 - 36.8
Mic	4.0 - 5.4	3.5 - 4.8	3.4 - 4.9	3.1 - 4.5	3.6 - 5.4
UI	80.5 - 85.0	82.1 - 86.2	81.2 - 86.0	81.6 - 84.8	81.2 - 86.1
Elong	2.6 - 6.0	3.0 - 4.8	2.8 - 6.1	3.3 - 4.4	3.2 - 4.8

Table 523-2. HVI performance of F4 PRs advanced to 2007 Preliminary Strains Nursery

	% lint	Mic	UHM	Str	UI	Elong
mean	35.9	4.2	1.19	31.8	84.5	3.8
range	27.3-45.7	3.1-5.0	1.05-1.34	27.1-36.9	80.0-87.5	2.5-5.5

Table 523-3. Performance of 10 advanced strains compared with two cultivars averaged across six locations in 2006

Genotype	Yield lb/a	Lint % %	Mic units	UHM in.	Strength g/tex	UI index	Elong %
FM 832 LL	1250	38.9	4.1	1.18	31.2	84	3.3
DP 491	1122	41.5	4.3	1.19	31.0	83	3.3
01 D-76	1079	38.6	4.1	1.16	31.8	83	3.1
01 C-67	1068	37.5	4.2	1.19	31.7	84	3.4
01 WR-56	1067	38.4	4.1	1.15	29.5	83	3.5
01 WM-27	1047	38.6	4.0	1.12	28.5	83	4.4
01 A-101	1018	36.3	4.1	1.19	31.4	84	4.3
01 D-61	1011	38.1	4.0	1.18	32.7	84	3.4
01 WP-47	1008	38.8	4.2	1.22	31.7	85	4.7
01 D-78	986	38.0	4.1	1.23	33.5	85	3.7
01 E-22	966	35.6	3.9	1.26	34.1	84	2.8
01 C-68	901	38.3	4.2	1.15	29.8	83	3.9

Table 523-4. Agronomic performance and fiber quality of ELSU Advance Strains evaluated at Weslaco during 2006. (Irrigated)

<b>Cultivar</b>	<b>Lint Yield (lb/ac)</b>	<b>Lint % (%)</b>	<b>Micro-naire (units)</b>	<b>Length (in)</b>	<b>Strength (g/tex)</b>	<b>UI (ratio)</b>	<b>Elongation (%)</b>
DPL 491	2213	42.7	4.7	1.18	29.3	83	3.4
ST 5599BR	2045	39.8	4.8	1.13	29.2	83	3.6
TAMCOT 22	1799	40.2	4.3	1.13	28.1	82	5.0
FM 832	1765	37.8	4.3	1.21	31.7	84	3.5
03 HiL B-182-39	1742	37.3	4.3	1.34	32.2	85	3.5
03 HiL B-147-21	1674	37.2	4.2	1.35	32.0	85	3.4
03 HiL B-182-7	1551	36.3	4.1	1.36	33.1	84	3.3
03 HiL B-182-10	1538	35.9	4.2	1.34	33.3	85	2.7
03 HiL B-182-21	1519	37.3	4.2	1.29	32.1	83	3.2
03 HiL B-182-3	1502	35.7	4.3	1.36	31.0	85	3.5
03 HiL B-147-23	1468	35.7	4.2	1.37	32.9	86	3.6
03 HiL B-139-17	1458	35.2	4.5	1.33	32.3	86	3.7
03 HiL A-106-8	1419	33.3	4.4	1.32	32.2	85	3.9
03 HiL A-106-30	1329	33.1	4.1	1.38	33.0	86	3.9
03 HiL B-182-34	1324	35.8	4.2	1.35	33.0	84	3.0
03 HiL B-139-2	1296	36.0	4.1	1.35	32.9	85	4.0
03 HiL B-182-41	1285	36.6	4.2	1.35	33.0	85	3.2
03 HiL B-182-33	1243	35.2	4.0	1.38	34.0	86	3.2
03 HiL A-106-11	1238	33.3	4.1	1.36	35.4	86	3.9
03 HiL B-139-28	1150	34.9	4.0	1.37	33.2	85	3.8
03 HiL C-66-16	1127	35.6	4.5	1.33	31.8	86	3.8
03 HiL A-106-25	1113	31.4	4.1	1.39	32.2	86	4.2
03 HiL B-182-6	1062	37.0	4.2	1.38	32.7	86	3.2
03 HiL B-147-22	1017	36.5	4.0	1.35	33.8	86	3.8
03 HiL A-106-15	958	33.1	4.3	1.39	31.4	87	4.5
03 HiL B-147-32	903	36.6	4.1	1.33	34.0	85	3.6
03 HiL C-155-22	902	38.0	4.2	1.34	33.0	86	3.3
03 HiL B-182-30	880	36.0	4.1	1.33	33.2	85	3.1
03 HiL B-182-4	836	36.1	4.3	1.37	30.0	86	3.2
03 HiL B-182-32	780	36.2	4.3	1.37	32.2	86	2.8
03 HiL B-147-13	771	36.0	4.0	1.35	35.0	86	3.1
03 HiL B-182-16	722	34.9	4.1	1.37	32.4	85	3.2
03 HiL B-182-9	705	38.3	4.4	1.33	32.3	86	2.7
03 HiL B-182-31	703	35.2	3.9	1.39	34.5	86	3.4
LSD (k=100) <sup>1</sup>	240	1.6	0.2	0.05	2.8	2	0.5
%CV	14.9	2.4	2.0	1.70	3.4	0.9	6.7
Mean	1266	36.2	4.2	1.33	32.5	85	3.5

1. Values within columns are different at approximately p=0.05 (k=100) if they differ by more than the LSD at the base of the column.

Table 523-5. Agronomic performance and fiber quality of ELSU Advance Strains evaluated at Thrall during 2006. (Dryland)

Cultivar	Lint Yield (lb/ac)	Lint % (%)	Micro-naire (units)	Length (in)	Strength (g/tex)	UI (ratio)	Elongation (%)
ST 5599BR	466	32.5	3.9	0.99	26.4	80	3.5
FM 832	454	29.8	3.5	1.07	28.9	81	2.9
TAMCOT 22	450	30.2	3.4	0.99	25.5	80	4.0
03 HiL B-182-3	439	26.7	3.3	1.26	35.7	83	3.5
03 HiL B-139-28	414	24.9	3.3	1.25	35.9	83	3.6
03 HiL B-182-21	408	26.3	3.6	1.21	34.3	82	3.1
03 HiL B-147-32	377	25.9	3.6	1.22	34.1	82	3.1
03 HiL B-147-23	362	25.5	3.3	1.25	35.3	83	3.4
03 HiL C-66-16	361	23.2	4.0	1.23	36.2	84	4.0
03 HiL A-106-8	354	24.3	3.7	1.29	35.9	85	4.6
03 HiL B-182-32	354	28.5	3.8	1.20	32.3	82	3.1
DPL 491	330	29.5	3.5	1.05	28.4	80	3.2
03 HiL A-106-15	323	22.5	3.4	1.29	36.2	85	4.8
03 HiL B-147-22	319	25.0	3.3	1.23	36.4	82	3.4
03 HiL B-139-17	318	24.9	3.3	1.24	35.3	82	3.4
03 HiL B-147-21	317	25.0	3.2	1.24	34.6	82	3.4
03 HiL B-182-33	312	26.5	3.5	1.25	33.7	82	3.0
03 HiL C-155-22	293	26.1	3.6	1.26	34.3	83	3.2
03 HiL B-182-4	293	26.8	3.6	1.22	34.1	82	3.4
03 HiL B-182-10	289	27.0	3.4	1.23	33.5	81	2.8
03 HiL A-106-11	279	21.4	3.3	1.33	36.8	86	4.4
03 HiL B-182-7	268	27.3	3.6	1.26	32.3	81	3.4
03 HiL A-106-30	258	22.7	3.5	1.24	35.8	83	4.1
03 HiL B-182-34	254	25.7	3.3	1.23	32.9	82	3.1
03 HiL B-182-31	242	26.0	3.4	1.20	34.7	82	3.1
03 HiL A-106-25	240	22.5	3.3	1.29	35.7	84	4.7
03 HiL B-182-9	227	27.4	3.6	1.20	32.0	80	3.1
03 HiL B-182-41	219	25.3	3.5	1.22	34.1	82	2.9
03 HiL B-147-13	203	23.9	3.4	1.18	34.6	84	3.6
03 HiL B-182-16	191	26.7	3.5	1.23	34.8	83	3.4
03 HiL B-182-30	189	25.7	3.5	1.22	34.4	82	3.6
03 HiL B-139-2	.	.	.	.	.	.	.
03 HiL B-182-6	.	.	.	.	.	.	.
03 HiL B-182-39	.	.	3.0	1.25	36.6	82	3.8
LSD (k-100_	124	2.2	0.4	0.05	2.9	1.9	0.4
CV	29.1	4.9	5.0	2.30	4.3	1.1	5.8
Mean	317	26.0	3.5	1.21	33.7	82.0	3.5

Table 523-6. Performance of TAM 01E-22 averaged over multiple locations and years in Central and South Texas.

Genotype	Yield	Percent lint	Mic	UHM	Str	UI	Elong
	-lb/a-	-%-	-units-	-in-	-g/tex-	-index-	-%-
TAM 01E-22	763 b	34.5 c	4.1 b	1.24 a	33.9 a	84 a	3.2 c
FiberMax 832	850 b	37.6 b	4.3 b	1.16 b	32.4 b	83 a	3.9 b
PSC 355	969 a	39.3 a	4.9 a	1.07 c	29.8 c	83 a	6.2 a
mean	861	37.1	4.4	1.16	32.0	83	4.5
CV	2.2	2.0	2.0	2.0	2.0	3.0	2.0