COLD TOLERANT COTTON FOR ULTRA EARLY PLANTING

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Cold Tolerance Defined

"Cold tolerance in plants" brings to mind at least three different things: frost tolerance, ability to be biologically active at low temperatures, and ability to survive at sub-optimum temperatures. Our take on the first two is that these might best be added to cotton by gene transfer. Based on our experience, we think the third can be achieved by screening and selection. The context of this paper is limited to *the survival of moist cottonseed at sub-optimum temperatures and the ability to germinate and emerge.*

Rationale for Earlier Planting

Long time averages indicate August is the driest month in the Mississippi Delta. It is also the harvest month for corn and soybeans, a real change from a few years ago. Cotton harvest has also advanced in the same period of time, but is still typically September/October rather than August. Planting one month early would take advantage of spring rains, eliminate the need for growth regulator, and match the growing need for photosynthesis with increasing daily radiation. Likely savings would include one irrigation and one or more insecticide applications. Effectiveness of defoliants would be enhanced by August temperatures. Last but not least, increased yields are likely.

The Field Planting in 2000

Fourteen lines that exhibited cold tolerance in screening were field tested in 2000. Each line was planted in two rows adjacent to a two row plot of Suregrow 125 grown as a check. Target date for planting was March 20; rains delayed planting until April 1. April weather was such that the major part of our crop was not planted until April 29, which permitted comparisons of early versus normal with very close to a month's difference.

Performance of CT Lines in 2000

Table 1 lists number of emerged seedlings from 16 t0 22 days after planting. Thirteen of the CT lines had stands superior to the 2 randomly selected check plots. The protracted period of emergence was in part a response to cool weather and in part to the 6.4 inches of rain that fell immediately after planting. Relative response of CT lines and the check is typified by those shown in Figure 1, 52 days after planting. Figure 2 shows development of CT 11 on June 30 when planted on indicated dates.

Table 2 summarizes results for stands as plants per foot, yields of lint per acre, and plant height for each of the CT lines and the adjacent check plot. The table is self explanatory; only CT-6 yielded less than the adjacent check.

Table 3 lists yields of the CT lines when planted on different dates. Ten CT lines were in yield tests planted on April 29; three of these yielded more when planted on the later date. Even with this exception, the data overall strongly indicate a yield advantage for the earliest planting date.

Comparative yields of the three highest yielding CT lines in the April 1 planting and commercial checks in yield tests planted on the indicated dates are in Table 4.CT 10 and 12 yielded with the best check, while CT 11 with highest yield in early planting dropped markedly when planted on May 11.

Table 1. Emerged Seedlings Per 30 Feet of Row on Indicated Days After Planting.

LINE	DAY 16	DAY 18	DAY 20	DAY 22
CT3	21	47	61	73
CT 10	32	60	68	70
CT 5	19	44	62	70
CT 1	25	53	62	66
CT 8	21	44	56	62
CT 11	28	49	58	62
CT 13	28	43	51	59
CT 7	22	42	56	59
CT 6	18	33	41	56
CT 12	25	42	50	54
CT 2	15	34	43	49
CT 4	15	33	42	47
CT 9	9	25	36	40
CHECK 1	8	18	25	29
CHECK 6	8	13	21	28
CT 14	7	11	22	27

Table 2. Plants Per Foot of Row at 78 Days and Yield and Height at Maturity.

	PLANTS/FOOT		LINT/ACRE		PLANT HEIGHT	
LINE ID	LINE	CHECK	LINE	CHECK	LINE	CHECK
CT-11	2.58	1.04	1411	911	118	130
CT-12	2.06	1.11	1392	843	125	130
CT-10	1.74	1.40	1296	1029	115	125
CT-5	2.98	1.29	1291	848	125	128
CT-9	2.11	1.16	1218	843	113	125
CT-7	1.84	1.12	1204	771	130	128
CT-8	2.01	1.33	1149	987	120	118
CT-2	1.82	0.85	1132	656	120	118
CT-3	2.73	0.54	1130	487	130	128
CT-13	2.19	1.08	1126	881	113	120
CT-4	1.54	1.12	1026	775	130	120
CT-1	2.22	0.73	1017	581	100	115
CT-6	1.47	1.25	885	962	115	130
CT-14	1.36	0.96	792	------	100	120

Table 3. Yields of Cold Tolerant Lines.

	DATE PLANTED		
LINE	4/1	4/29	5/11
CT-11	1411		824
CT-12	1392	1240	
CT-10	1296	963	
CT-5	1291	1303	
CT-9	1218	1138	
CT-7	1204	1005	
CT-8	1149	1080	
CT-2	1132		918
CT-3	1130	1173	
CT-13	1126	1009	
CT-4	1026		984
CT-1	1017	1000	
CT-6	885	1146	

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Table 4. Comparative Yields of Top 3 Ct Lines and Checks.

VARIETY	4/1	4/29	5/11
CT-11	1411		898
PSC 355			1035
BXN 47			1041
SG 747			940
CT-12	1392	1240	
PSC 355		1212	
BXN 47		1192	
SG 747		1101	
CT-10	1296	1063	
BXN 47		998	
SG 747		1077	

Spinning test results in Table 5 show a range of quality in the CT lines, with most of them above commercial checks.

Figure 3 shows a typical check vs CT line comparison, and Figure 4 summarizes the story of ultra-early planting. With days to emergence and days to first flower both extended in the early planted crop, dates of first bloom, defoliation, and harvest are still sufficiently advanced to result in meaningful advantages. Higher yields with reduced inputs add profits to the picture.

Availability of Seed

When the title for this paper was submitted, there were acreage of four CT lines in West Texas. With harvest normally in November and the weather pattern in 2000, at the date of this writing, December 1, the status of that seed crop is still unknown.

CT 10, 11, and 12 are in a winter generation planted in August for December harvest. Quantities of these new lines will not permit any commercial sales in 2001.

Seed Source CT lines will be marketed by the Douglass King Company of San Antonio, Texas. The breeder and marketer are in full agreement that all available seed will be planted for increase in 2001. We regret introductory sales will not be possible now.

Table 5. Spinning Test Results.

ENTRY	MIC	UHM	STR	YARN
CT-8	3.8	1.13	22.6	135.2
CT-1	3.8	1.13	20.1	135.1
CT-10	3.8	1.17	22.3	133.9
CT-11	3.4	1.19	21.6	132.7
CT-5	4.3	1.09	23.2	132.6
CT-13	4.1	1.15	22.6	132.5
CT-6	4.1	1.11	22.8	129.9
CT-7	4.5	1.11	19.2	127.6
CT-9	3.7	1.19	21.1	126.7
CT-12	3.6	1.17	19.7	125.6
CT-3	4.3	1.09	19.9	120.4
PSC 355	5.1	1.19	23.4	125.1
SG 747	4.6	1.15	19.9	120.4
CT-4	3.9	1.09	19.9	119.1
CT-2	2.9	1.13	18.9	118.2
SG 125	4.1	1.13	18.8	115.3
CT-14	4.4	1.09	20.9	115.2

Figure 1. Contrasted Stand and Growth: Check Left and CT Line Right of Box.

Figure 2. Contrasted Planting Dates: Fruiting of CT-11 on June 30.

Figure 3. Yield Contrast at Defoliation Time: Check Left, CT Line Right.

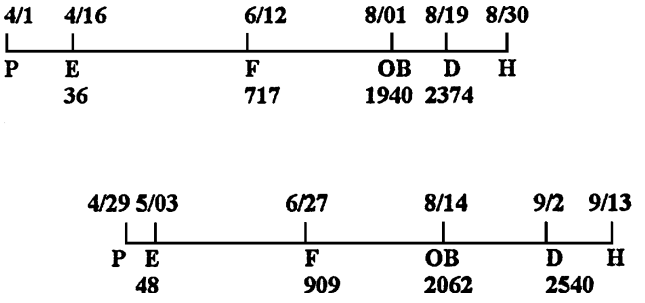

Figure 4. Crop Development after 2 Dates of Planting. P - Planting Date, E - Emergence, F - First Flower, OB - First Open Boll, D - Defoliation, and H - Harvest. Numbers = Accumulated DD60's.