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NOTICE OF RELEASE OF ARKOT 9203-03 AND ARKOT 9203-17 GERMPLASM LINES OF COTTON

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The Arkansas Agricultural Experiment Station announces the release of two noncommercial breeding lines of cotton, *Gossypium hirsutum* L., designated Arkot 9203-03 and Arkot 9203-17. The two sister lines, developed using the generalized procedures outlined by Bourland (2004), were derived from a 1992 cross between 'H-1330' (Bourland, 1996) and 'Delcot 344' (Sappenfield, 1987). Within F_2 populations grown at Southeast Branch Station at Rohwer, AR, in 1993, bolls from visually superior individual plants were harvested and bulked. Plants derived from F_3 seeds were selected using modified procedures of Bird (1982) to produce seeds for F_4 progeny rows grown in 1995. Progenies designated as 9203-03 and 9203-17 were among the ones promoted and tested in replicated strain tests in 1996 and 1997. Individual plant selections from the F_6 generation of these two strains were evaluated as progenies in 1997. Two of these selections produced Arkot 9203-03 (tested as 9203-03-20) and Arkot 9203-17 (tested as 9203-17-12).

The two lines were included in 18 replicated field tests at four Arkansas Agricultural Research Station sites in the Mississippi River Delta and compared to 'SG 747' in 2001, 'SG 105' in 2002-2003, and 'DP 444 BG/RR' in 2004 (Tables 1 and 2). Over all tests, lint yields of Arkot 9203-03 were 10% greater than the checks, and were significantly higher than the check cultivar in 9 of the 18 tests. The increased yield of the line appeared to be associated with producing more seed per area and a higher number of fibers per seed than the check cultivars. Yields of Arkot 9203-17 were essentially equal to the check cultivars in the 18 Arkansas tests, but exceeded 'SG105' and Arkot 9203-03 in tests at Tifton, GA, in 2002 and 2003 (Table 3).

Table 1. Performance of 9203-03-20 and 9203-17-12 in Arkansas test sites from 2001 through 2004.

Years	Loc[1]	Line/-signifcance[2]	Lint yield	Lint fract	Plant ht	Micro-naire	Len-gth	Unif. index	Stren-gth	Elon-gation
			lb/a	%	cm		in.	%	g/tex	%
03	Man	9203-03-20	1097	40.8	95	4.0	1.18	84.9	31.0	8.7
03	Man	*H,E,L*	*1,0,0*	*0,1,0*	*1,0,0*	*0,1,0*	*0,1,0*	*0,1,0*	*0,1,0*	*0,1,0*
03	Man	9203-17-12	751	35.3	85	3.7	1.18	82.3	31.8	8.0
03	Man	*H,E,L*	*0,1,0*	*0,0,1*	*0,1,0*	*0,0,1*	*0,1,0*	*0,1,0*	*0,1,0*	*0,1,0*
03	Man	sl check	917	41.0	78	4.4	1.15	83.8	29.8	8.2
01-04	K-ir	9203-03-20	1151	39.5	113	4.2	1.17	85.2	31.3	7.2
01-04	K-ir	*H,E,L*	*3,2,0*	*0,5,0*	*2,2,0*	*0,4,1*	*0,4,1*	*0,4,1*	*2,3,0*	*0,1,4*
01-04	K-ir	9203-17-12	1000	38.4	103	4.4	1.20	85.5	34.2	7.0
01-04	K-ir	*H,E,L*	*1,3,1*	*0,5,0*	*0,4,0*	*0,2,3*	*3,2,0*	*3,2,0*	*5,0,0*	*0,1,4*
01-04	K-ir	sl check	1087	39.1	100	4.6	1.17	85.9	29.9	7.9
01,02,04	C-ir	9203-03-20	1181	39.7	136	4.0	1.16	85.0	31.2	6.7
01,02,04	C-ir	*H,E,L*	*0,3,0*	*0,2,1*	*1,2,0*	*1,1,1*	*0,3,0*	*0,3,0*	*1,2,0*	*0,2,1*
01,02,04	C-ir	9203-17-12	1167	37.7	131	4.0	1.21	85.8	33.5	6.4
01,02,04	C-ir	*H,E,L*	*0,3,0*	*0,2,1*	*1,2,0*	*0,2,1*	*3,0,0*	*0,3,0*	*2,1,0*	*0,1,2*
01,02,04	C-ir	sl check	1240	39.9	125	4.0	1.17	85.2	29.9	7.0

01-04	M-ir	9203-03-20	1022	40.4	119	4.2	1.15	84.4	32.1	7.2
01-04	M-ir	*H,E,L*	*3,3,0*	*0,6,0*	*3,2,0*	*0,6,0*	*0,6,0*	*0,4,2*	*2,4,0*	*0,3,3*
01-04	M-ir	9203-17-12	952	38.1	115	4.3	1.19	85.3	33.9	7.3
01-04	M-ir	*H,E,L*	*0,6,0*	*0,5,1*	*1,4,0*	*0,5,1*	*4,2,0*	*1,4,1*	*3,3,0*	*0,4,2*
01-04	M-ir	sl check	940	39.4	109	4.5	1.15	84.6	31.3	7.9
02-04	R-ir	9203-03-20	1788	39.1	121	4.4	1.14	84.6	32.2	6.6
02-04	R-ir	*H,E,L*	*2,1,0*	*0,3,0*	*2,1,0*	*0,2,1*	*0,2,1*	*0,3,0*	*2,1,0*	*0,2,1*
02-04	R-ir	9203-17-12	1516	37.8	120	4.6	1.18	84.7	34.3	5.9
02-04	R-ir	*H,E,L*	*0,3,0*	*0,1,2*	*2,1,0*	*0,3,0*	*1,2,0*	*0,3,0*	*3,0,0*	*0,0,3*
02-04	R-ir	sl check	1293	39.0	109	4.7	1.16	85.1	30.5	7.1
01-04	All	9203-03-20	1157	39.4	117	4.2	1.16	84.6	31.6	6.9
01-04	All	*H,E,L*	*9,9,0*	*0,17,1*	*9,7,0*	*1,14,3*	*0,16,2*	*0,16,2*	*7,11,0*	*3,9,6*
01-04	All	9203-17-12	1045	37.3	111	4.2	1.19	85.1	33.6	6.6
01-04	All	*H,E,L*	*1,16,1*	*0,13,5*	*4,12,0*	*0,13,5*	*11,7,0*	*1,15,2*	*10,8,0*	*0,11,7*
01-04	All	sl check	1055	38.9	105	4.4	1.17	85.2	29.9	7.5

[1]Locations included irrigated tests at Manila (Man), Keiser (K-ir), Clarkedale (C-ir), Marianna (M-ir) and Rohwer (R-ir) plus non-irrigated tests at Keiser (K-ni) and Marianna (M-ni).

[2]H,E,L = no. of tests that line was significantly higher (H), equal to (E) and lower (L) than check cultivars.

Table 2. Yield components for 9203-03-20 and 9203-17-12 in Arkansas test sites from 2001 through 2004.

Years	Loc.[1]	Line/Significance[2]	No. of seed/acre	Lint index	Seed index	Fibers/seed
			mil	g	g	ca. no.
03	Man	9203-03-20	6.756	7.4	10.6	18488
03	Man	*H,E,L*	*0,1,0*	*0,1,0*	*0,1,0*	*0,1,0*
03	Man	9203-17-12	5.818	5.9	10.6	16462
03	Man	*H,E,L*	*0,1,0*	*0,0,1*	*0,1,0*	*0,1,0*
03	Man	sl check	5.653	7.4	10.6	17524
01-04	K-ir	9203-03-20	7.496	7.0	10.4	20056
01-04	K-ir	*H,E,L*	*2,3,0*	*0,4,1*	*0,5,0*	*1,3,0*
01-04	K-ir	9203-17-12	6.756	6.8	10.9	18268
01-04	K-ir	*H,E,L*	*0,5,0*	*0,5,0*	*0,5,0*	*0,4,0*
01-04	K-ir	sl check	6.723	7.2	10.8	18877
01,02,04	C-ir	9203-03-20	8.350	6.5	9.7	18451
01,02,04	C-ir	*H,E,L*	*0,3,0*	*0,2,1*	*0,3,0*	*1,1,0*
01,02,04	C-ir	9203-17-12	7.853	6.3	10.2	17843
01,02,04	C-ir	*H,E,L*	*0,3,0*	*0,2,1*	*2,1,0*	*0,2,0*
01,02,04	C-ir	sl check	8.685	6.4	9.3	18142
01-04	M-ir	9203-03-20	6.691	7.0	10.5	19505
01-04	M-ir	*H,E,L*	*3,3,0*	*0,6,0*	*0,6,0*	*0,4,1*
01-04	M-ir	9203-17-12	6.149	7.0	11.2	18536
01-04	M-ir	*H,E,L*	*1,4,1*	*0,6,0*	*3,3,0*	*0,5,0*
01-04	M-ir	sl check	6.399	7.0	10.5	18259
02-04	R-ir	9203-03-20	11.683	6.8	10.1	18266
02-04	R-ir	*H,E,L*	*2,1,0*	*0,3,0*	*0,2,1*	*1,2,0*

02-04	R-ir	9203-17-12	10.543	6.7	10.8	17875
02-04	R-ir	*H,E,L*	*2,1,0*	*0,3,0*	*1,1,1*	*0,3,0*
02-04	R-ir	sl check	9.706	6.9	10.7	17567
01-04	All	9203-03-20	7.874	6.7	10.2	17972
01-04	All	*H,E,L*	*7,11,0*	*0,16,2*	*0,17,1*	*3,11,1*
01-04	All	9203-17-12	7.262	6.5	10.7	16799
01-04	All	*H,E,L*	*3,14,1*	*0,16,2*	*7,11,1*	*0,15,1*
01-04	All	sl check	7.254	6.7	10.3	16884

[1]Locations included irrigated tests at Manila (Man), Keiser (K-ir), Clarkedale (C-ir), Marianna (M-ir) and Rohwer (R-ir) plus non-irrigated tests at Keiser (K-ni) and Marianna (M-ni).

[2]H,E,L = no. of tests that line was significantly higher (H), equal to (E) and lower (L) than check cultivars.

Table 3. Performance of two Univ. of Arkansas cotton lines at Tifton, Georgia in 2002 and 2003.

Yr	Strain	Lint yield	%ck	Lint fract.	%ck	Mic	%ck	UHM	%ck	UI	%ck	Str	%ck
		lb/a		%				in.		%		g/tex	
02	9203-03-20	1562	106	39.3	99	4.4	85	1.10	102	83.5	99	29.1	98
02	9203-17-12	1748	119	39.3	99	4.8	92	1.13	105	84.2	100	32.2	108
02	SG105	1473		39.6		5.2		1.08		84.4		29.8	
02	LSD0.10	144		NS		0.3		NS		NS		1.6	
02	CV %	8.1		2.6		3.8		3.0		0.9		3.2	
03	9203-03-20	794	100	41.7	104	4.7	90	1.07	99	83.5	98	30.9	101
03	9203-17-12	842	106	40.2	100	4.8	92	1.09	101	83.7	99	31.0	101
03	SG105	793		40.1		5.2		1.08		84.8		30.6	
03	LSD0.10	135		1.0		NS		0.03		NS		1.3	
03	CV%	13.2		1.4		4.4		1.6		0.9		2.6	

Compared to the check cultivars, fibers of both lines tended to be finer (lower micronaire) and stronger, but had lower elongation than the check cultivars (Tables 1). Fibers of Arkot 9203-17 were longer and stronger than the check cultivars and Arkot 9203-03.

The two lines were taller than the check cultivars with Arkot 9203-03 being taller than Arkot 9203-17 (Table 1). Although taller than the check cultivars, open boll ratings in 2003 and 2004 indicated that the lines were as early or earlier maturing than the check cultivars (Table 4). Over six tests, leaf pubescence of Arkot 9203-03 and Arkot 9203-17 averaged 4.4 based on a rating scale of 1 (smooth leaf) to 7 (very hairy) (Bourland et al., 2003).

Table 4. Results of single-location variables for two UA cotton lines in 2002, 2003, and 2004.

Strain	2003 OB[1]	2004 OB	2002 Vert.[2]	2004 Vert.	2004 Fusarium[3]	2003 TPB[4]
	ca. %	ca.%	ca. %	ca. %	%	%
9203-03-20	45	66	33	48	19	54
9203-17-12	45	68	33	55	16	63
SG 105	33	.	14	.	.	51
DP444BG/RR	.	68	.	51	.	.
Frego bract (susceptible)	.	.	.	.	.	86
M-315 (resistant)	.	.	.	.	10	.
Rowden (susceptible)	.	.	.	.	70	.
LSD0.10	9	4	10	11	20	10

CV%	20.2	14.6	26.8	19.3	16.4	18.4
[1] Open bolls (OB) visually rated in 2003 and 2004 at Rohwer.						
[2] Incidence (ca. % of affected plants) of Verticillium wilt visually rated at Clarkedale in 2002 and 2004.						
[3] Fusarium wilt (% dead plants) in 2003 National Fusarium Wilt Test at Tallassee, AL.						
[4] Tarnished plant bug (TPB) at Keiser = % flowers with discolored anthers in test bordered with mustard in 2003.						

Arkot 9203-03 and Arkot 9203-17 display good host plant resistance traits. During selection, both lines were screened for resistance to races 1, 2, 7, and 18 of *Xanthomonas campestris* pv. *malvacearum* (Smith) Dye, the causal agent of bacterial blight. Resistance to these races conveys resistance to all known U.S. races of this pathogen. In subsequent tests, neither line exhibited symptoms of bacterial blight even after field inoculations with the pathogen. Wilted plants associated with Verticillium wilt (caused by *Verticillium dahliae*, Kleb.) of both lines exceeded SG 105 in a 2002 field test, but were equal to DP 444BR/RR in 2004 (Table 4). In the 2004 National Cotton Fusarium Wilt Test at Tallassee, AL, resistance levels of both Arkot 9203-03 and Arkot 9203-17 to fusarium wilt [caused by *Fusarium oxysporum* Schlect. F. sp. *vasinfectum* (Atk.) Snyd. & Hans.] were equal to the resistant check (Glass et al., 2004). In 2003, both lines were more resistant to tarnished plant bug (*Lygus lineolaris* (Palisot de Beauvois)) than the susceptible frego-bract check, but Arkot 9203-17 had significantly more damaged flowers than SG 105.

Arkot 9203-03 had the second highest yield of 19 lines evaluated in the 2003 Regional Breeders' Network Test (Table 5). These data suggest that the line has wide adaptation. Over the eight locations, Arkot 9203-03 had significantly higher lint percent, larger bolls, and lower fiber strength, elongation and micronaire than PSC 355 (Table 6). (Arkot 9203-17 was not evaluated in this test.)

Table 5. Mean yields by location in the 2003 Regional Breeders' Network test.

Line	Overall	Albany, GA	Hartsville, SC	Keiser, AR	Miss.St MS	Miss.St. ARS	Stone-ville, MS	Tallassee, AL	Bossier City,LA
	lb/a	lb/a	lb/a	lb/a	lb/a	lb/a	lb/a	lb/a	lb/a
9203-03-20	1307	1392	1857	857	1226	1108	1691	1232	1095
PSC 355	1278	1354	1648	821	1116	922	1862	1176	1325
FM 958	1252	1288	1744	759	1049	1063	1665	1285	1162
DeltaPearl	1186	1156	1481	620	1116	1124	1404	1314	1275
Test mean	1161	1160	1495	761	1010	1036	1621	1146	1053
LSD (.05)	89	284	260	140	178	225	193	211	242

Table 6. Over location means for fiber quality in the 2003 Regional Breeders' Network Test.

Line	Lint fract.	Boll size	Length	Uniformity	Strength	Elongation	Micronaire
	%	g	in.	%	g/tex	%	
9203-03-20	41.5	5.93	1.13	84.5	31.9	7.9	4.5
PSC 355	40.8	5.11	1.12	84.8	32.6	9.8	5.0
FM 958	41.6	5.73	1.16	84.8	33.5	6.9	4.6
DeltaPearl	41.1	5.17	1.18	84.3	32.2	7.2	4.7
Test mean	40.7	5.66	1.14	84.6	32.1	8.7	4.7
LSD (.05)	0.6	0.27	0.01	0.4	0.5	0.2	0.1

The combinations of yield adaptation, fiber properties, and specific host plant resistance traits of these lines make the lines valuable to cotton breeding programs. Arkot 9203-03 appears have superior yielding ability but lower fiber quality than Arkot 9203-17. Development of the two lines was supported in part by funding from Cotton Incorporated. Small quantities of Arkot 9203-03 and Arkot 9203-17 seed may be obtained for breeding purposes from F.M. Bourland, P.O. Box 48, Northeast Research and Extension Center, Keiser, AR 72351. Unless specifically approved by the Arkansas Agricultural Experiment Station, the lines may not be used as recurrent parents in a breeding program.

References

Bird, L.S. 1982. The MAR (Multi-Adversity Resistance) system for genetic improvement of cotton. Plant Dis. 66:-172-176.

Bourland, F.M. 1996. Registration of 'H1330' cotton. Crop Sci. 36:813.

Bourland, F. M. 2004. Overview of the University of Arkansas cotton breeding program. p. 1093-1097. *In* Proc. Beltwide Cotton Conf., San Antonio, TX. 5-9 Jan. 2004. Natl. Cotton Counc. Am., Memphis, TN.

Bourland, F. M., J. M. Hornbeck, A. B. McFall, and, S. D. Calhoun. 2003. A rating system for leaf pubescence of cotton. J. Cotton Sci. 7:8-15.

Glass, K.M., W.S. Gazaway, and E. van Santen. 2004. 2004 National cotton fusarium wilt report. Agronomy and Soils Department Series No. 262. Auburn University, Auburn, AL.

Sappenfield, W. P. 1987. Registration of 'Delcot 344' cotton. Crop Sci. 27:150.