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NOTICE OF RELEASE OF ARKOT 9315 AND ARKOT 9409 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 9315 and Arkot 9409. The lines were developed using the generalized procedures outlined by Bourland (2004). Both lines were derived from crosses with a common parent, Arkot 8606 (Bourland and Benson, 2002). The second parent of Arkot 9315 and Arkot 9409 was SG 39 (an advanced breeding line, sister of 'SG 747', both derived by direct selection from 'SG 125') and SG 125 (commercial cultivar).

Within F_2 populations grown at Southeast Branch Station at Rohwer, AR, in 1995 and 1996, bolls from visually superior individual plants were harvested and bulked. Seed of individual plants selected from F_3 populations were selected to produce seeds for F_4 progeny rows grown the following year. Progenies designated as 9315-33 and 9409-21 were among the ones promoted and tested in replicated strain tests in 1998 and 1999. Individual plant selections from the F_6 generation of these two strains were evaluated as progenies in 1999 and 2000. Two of these selections produced Arkot 9315 (tested as 9315-33-21) and Arkot 9409 (tested as 9409-40-08).

The two lines were compared to 'SG 105' and 'PSC 355' in 12 replicated field tests at four Arkansas Agricultural Research Station sites and an off-station site in the Mississippi River Delta from 2001 through 2004 (Tables 1 and 2). Mean lint yields of the lines over all Arkansas tests were similar to check cultivars. Lint yields of Arkot 9315 yielded significantly more than SG 105 in four of the 14 tests, while Arkot 9409 yielded significantly less than SG 105 in four of the 14 tests. Comparing the two lines, Arkot 9409 yielded relatively better at Clarkedale and Marianna, while Arkot 9315 produced higher yields at all other Arkansas locations. Both lines yielded significantly less than PSC 355 at Tifton, GA in 2002 and Arkot 9409 yielded significantly less than either check at Tifton, GA in 2004 (Table 3). Otherwise, yields of Arkot 9315 and Arkot 9409 were statistically equal to the two check cultivars in the five tests conducted in GA and MS.

Table 1. Performance of two cotton lines over Arkansas locations in 2001 (at M), 2002 (at K,C,M,R) 2003 (at B,K,M,R) and 2004 (at B,K,M,R)[1]

Year	Line	Lint yield	Lint fract.	Ht	Seed Ind.	Lt. Ind.	Seed/ acre	Fiber/ seed	Fiber properties				
									Mic	Len	Uni	Str	Elo
		lb/a	%	cm	g	g	mil.	no.		in.	%	g/tex	%
2001	9315-33-21	957	37.9	.	11.6	7.1	6.084	14964	4.8	1.17	85.4	29.6	8.1
2001	9409-40-08	1120	38.9	.	9.9	6.1	7.783	13573	4.6	1.14	84.1	30.5	8.6
2001	PSC 355	951	39.8	.	9.6	6.4	6.754	14085	4.8	1.14	84.3	30.8	8.8
2001	SG747	892	39.6	.	10.3	6.9	5.863	15210	4.5	1.18	85.5	27.3	8.7
2001	LSD 0.10	110	4.6	.	0.7	0.7	0.798	1940	0.3	0.03	0.8	1.9	ns
2002	9315-33-21	1080	36.7	110	11.5	6.8	7.698	15159	4.6	1.15	85.1	30.5	4.7
2002	9409-40-08	1165	37.0	99	9.9	5.9	8.334	15256	4.0	1.15	84.7	29.8	5.0
2002	PSC355	1107	36.2	115	10.4	6.0	7.953	14288	4.3	1.15	85.4	30.0	5.7
2002	SG105	1075	36.2	106	10.1	5.8	8.735	13829	4.2	1.17	85.8	30.1	4.9
2002	LSD0 .10	73	1.6	5	0.5	0.5	0.509	961	0.2	0.02	0.6	0.9	0.3
2003	9315-33-21	948	38.9	90	12.0	7.8	5.598	16347	4.9	1.15	84.7	31	8.3
2003	9409-40-08	819	39.6	87	11.0	7.3	5.157	16179	4.7	1.15	84.1	31.2	8.3
2003	PSC355	1035	40.2	103	11.1	7.6	6.203	16543	4.9	1.14	84.2	31.4	8.8

2003	SG105	865	39.6	100	11.1	7.3	5.432	15735	4.8	1.16	84.6	30.7	8.3
2003	LSD0 .10	80	1.1	6	0.4	0.3	0.502	1149	0.2	0.02	0.8	1.3	0.3
2004	9315-33-21	1337	38.7	89	11.4	7.5	8.065	14860	5.2	1.15	85.9	31.3	4.9
2004	9409-40-08	1278	38.7	84	10.1	6.6	8.813	14812	4.5	1.19	85.2	31	5.1
2004	PSC355	1273	39.1	93	10.3	6.8	8.509	13636	5	1.16	85.8	31.4	5.8
2004	SG105	1367	39.3	89	10.2	6.9	9.062	14774	4.6	1.18	85.8	32	4.9
2004	LSD0 .10	76	0.8	4	0.5	0.2	0.51	1053	0.3	0.02	0.5	1.1	0.3

[1] Tests were conducted at B (Manila), K (Keiser), C (Clarkedale), M (Marianna, and R (Rohwer).

Table 2. Performance of two UA cotton lines over years at Manila (B), Keiser (K), Clarkedale (C), Marianna (M), and Rohwer (R).

Year	Line	Lint yield	Lint fract.	Ht	Seed Ind.	Lt. Ind.	Seed/ acre	Fiber/ seed	Fiber properties				
									Mic	Len	Uni	Str	Elo
		lb/a	%	cm	g	g	mil.	no.		in.	%	g/tex	%
B, 03-04	9315-33-21	897	39.1	77	11.8	7.7	5.318	15499	5.1	1.165	85.3	30.8	6.5
B, 03-04	9409-40-08	784.5	40.2	71	10.4	7.0	5.099	16327	4.5	1.15	84.3	29.8	6.6
B, 03-04	PSC355	794.5	39.8	83	10.7	7.2	4.995	16408	4.7	1.165	84.4	31.3	7.3
B, 03-04	SG105	736.5	38.7	77	10.1	6.6	5.004	15006	4.6	1.15	85.1	29.7	6.6
K,02-04	9315-33-21	1052	37.5	96	11.5	7.2	6.773	15114	4.8	1.16	85.7	31.1	6.4
K, 02-04	9409-40-08	975	37.8	84	10.5	6.6	6.835	15398	4.4	1.173	85.0	31.7	6.3
K, 02-04	PSC355	1081	38.9	98	10.9	7.1	6.980	14512	5.0	1.157	85.5	31.2	7.1
K, 02-04	SG105	1029	38.2	94	10.6	6.8	6.939	14786	4.5	1.193	86.2	30.9	6.2
C, 02&04	9315-33-21	969	37.6	108	10.9	6.8	7.120	15016	4.6	1.155	85.0	30.8	4.6
C, 02&04	9409-40-08	1043	38.5	101	9.7	6.3	7.114	15519	4.1	1.165	84.4	28.8	5.0
C, 02&04	PSC355	1016	38.1	116	9.9	6.2	6.616	14236	4.4	1.16	85.5	30.9	5.3
C, 02&04	SG105	1031	38.7	104	9.6	6.2	7.717	14287	4.4	1.165	85.1	29.9	4.8
M, 01-04	9315-33-21	983	38.4	92	11.8	7.5	6.200	15802	4.9	1.16	85.4	30.7	6.4
M, 01-04	9409-40-08	1048	38.8	87	10.4	6.6	7.134	14813	4.5	1.16	84.6	30.8	6.8
M, 01-04	PSC355	960	39.6	101	10.5	6.6	6.587	13996	4.9	1.15	85.0	30.7	7.4
M, 01-04	SG105	944	38.1	98	10.5	6.7	6.856	14844	4.5	1.18	85.6	31.0	6.7
R, 02-04	9315-33-21	1494	38.5	101	12.0	7.7	8.894	14999	5.4	1.133	85.4	31.0	5.8
R, 02-04	9409-40-08	1393	38.1	103	10.4	6.6	9.565	14540	4.6	1.173	85.1	31.0	6.0
R, 02-04	PSC355	1496	39.3	112	10.4	6.9	10.266	14633	4.9	1.143	85.0	30.3	6.7
R, 02-04	SG105	1426	38.5	105	10.7	6.7	9.817	14244	4.8	1.157	85.3	30.9	6.1
All, 01-04	9315-33-21	1093	38.2	95	11.7	7.4	6.906	15327	5.0	1.15	85.4	30.9	6.0
All, 01-04	9409-40-08	1068	38.6	89	10.3	6.6	7.297	15197	4.4	1.16	84.7	30.6	6.2
All, 01-04	PSC355	1085	39.2	102	10.5	6.8	7.236	14622	4.8	1.15	85.1	30.8	6.8
All, 01-04	SG105	1048	38.4	97	10.4	6.6	7.367	14646	4.6	1.17	85.5	30.6	6.2

Table 3. Performance of two UA cotton lines at Tifton, GA, Stoneville, MS, and all locations.

Test	Line	Lint yield	Lint fract.	Mic	Len	Uni	Str	Elo
		lb/a	%		in.	%	g/tex	%
02 GA	9315-33-21	1515	39.8	5.4	1.10	83.9	29.1	.

02 GA	9409-40-08	1481	40.9	5.1	1.12	83.7	28.9	.
02 GA	PSC355	1780	40.9	5.0	1.13	84.5	31.4	.
02 GA	SG105	1473	39.6	5.2	1.08	84.4	29.8	.
02 GA	LSD0.10	144	NS	0.3	NS	NS	1.6	.
03 GA	9315-33-21	888	41.2	5.3	1.07	84.6	29.4	.
03 GA	9409-40-08	921	42.1	5.1	1.07	83.3	27.7	.
03 GA	PSC355	929	41.3	5.1	1.12	85.2	29.0	.
03 GA	SG105	793	40.1	5.2	1.08	84.8	30.6	.
03 GA	LSD0.10	135	1.0	NS	0.03	NS	1.3	.
04 GA	9315-33-21	1271	41.4	5.8	1.11	84.6	29.4	4.7
04 GA	9409-40-08	890	40.0	5.1	1.12	84.0	28.7	4.7
04 GA	PSC355	1218	40.7	5.2	1.11	84.1	29.4	5.4
04 GA	SG105	1173	40.2	5.3	1.15	84.1	30.5	4.5
04 GA	LSD0.10	110	1.5	0.3	0.04	1.1	1.9	0.6
04 MS[1]	9315-33-21	1437	40.7	5.1	1.14	85.7	30.4	4.7
04 MS	9409-40-08	1464	41	4.5	1.15	84.8	28.6	5.1
04 MS	PSC355	1366	41.3	4.7	1.13	85.1	29.9	6.3
04 MS	SG105	1415	41.1	4.8	1.16	85.4	30.3	5.2
04 MS	LSD0.10	109	0.8	0.2	0.03	1.1	1.2	0.5
All[2]	9315-33-21	1153	38.9	5.1	1.1415	85.2	30.5	5.8
All	9409-40-08	1117	39.3	4.5	1.1525	84.6	30.0	6.0
All	PSC355	1154	39.7	4.8	1.1454	85.0	30.6	6.7
All	SG105	1105	39.0	4.7	1.1583	85.3	30.5	5.9

[1] Lines were evaluated in two tests near Stoneville, MS in 2004.

[2] Means over all test sites in Arkansas (Tables 1 & 2), Georgia, and Mississippi.

In Arkansas tests, basic yield components, i.e. lint index and number of seed per acre, of Arkot 9409 were similar to check cultivars (Table 1). In contrast, yields of Arkot 9315 were derived from relatively fewer seed per acre and more lint per seed (lint index) than the check cultivars. According to Lewis et al. (2000), the combination of yield components associated with Arkot 9315 should contribute to more stable yield production. Seed size of Arkot 9315 tended to be larger than seed size of Arkot 9409 and the check cultivars. Lint percentages and fiber quality of Arkot 9315 and Arkot 9409 were similar to the check cultivars.

Arkot 9409 produced shorter plant height and earlier maturation (open boll percentage) than Arkot 9315 and SG 105 (Tables 1 and 2). Both lines tended to be shorter and earlier maturing than PSC 355. Over three tests, leaf pubescence of Arkot 9315 and Arkot 9409 averaged 1.4 and 2.2, respectively, based on a rating scale of 1 (smooth leaf) to 7 (very hairy) (Bourland et al., 2003) (Table 4). In the same tests, leaf pubescence of SG 105 and PSC 355 were 2.0 and 7.0, respectively. Density of marginal bract trichomes on Arkot 9409 were significantly less than Arkot 9315 and SG 105, which had significantly less marginal bract density than PSC 355. Both lines had significantly smaller bracts than SG 105.

Table 4. Morphological and host plant resistance measurements for two UA cotton lines.

	Leaf pubescence[1]			**2004 Bract[2]**			**Vert. Wilt[3]**		**Fus. wilt[4]**		**Rhiz[5]**	**TPB dam.[6]**	
Strain	**2002**	**2003**	**2004**	**Tric.**	**Cir.**	**Tot. tric.**	**2002**	**2004**	**2003**	**2004**	**index[6]**	**2003**	**2004**
				#/cm	**cm**	**#/br.**	**ca. %**	**ca.%**	**%**	**%**		**%**	
9315-33-21	1.5	1.1	1.6	26.5	31.8	838	13	69		14	4.5	55	14
9409-40-08	2.6	1.2	2.7	16.8	32.9	546	50	78	24	.	2.9	51	10

PSC355	7.0	7.0	7.0	32.1	30.0	967	53	69	.	.	6.1	50	13
SG105	1.9	1.5	2.5	23.8	42.1	1001	14	61	.	.	5.5	51	19
FregoBract1	.	.	.	.	.	.	.	.	.	.	.	80	53
FregoBract2	.	.	.	.	.	.	.	.	.	.	.	91	55
M-315	.	.	.	.	.	.	.	.	10	4	.	.	.
Rowden	.	.	.	.	.	.	.	.	70	80	.	.	.
LSD0.10	.	1.2	0.9	5.9	3.7	20	10	12	20	21	1.2	10	5
[1] Leaf pubescence visually rated at Keiser from 1 (smooth leaf to 7 (very hairy).													
[2] Bract trichomes density, circumference, and total trichomes/bract (density * circumference) at Keiser.													
[3] Incidence (ca. % of affected plants) of Verticillium wilt visually rated in 2002 and 2004 at Clarkedale.													
[4] Fus.wilt (% dead) in National Fusarium Wilt Test at Tallassee, Al, compared to M-315 (res) and Rowden (sus).													
[5] Res. to *Rhizoctonia solani* evaluated in inoculated greenhouse beds, disease rated from 0 (none) to 8 (dead).													
[6] Tarnished plant bug (TPB) incidence determined by % white flowers with discolored anthers in test bordered with mustard in 2003 and 2004 at Keiser.													

Arkot 9315 and Arkot 9409 have been evaluated for resistance to diseases (bacterial blight, Verticillium wilt, Fusarium wilt, and seeding disease) and to insects (tarnished plant bug). During selection, both lines were screened for resistance to multiple races of *Xanthomonas campestris* pv. *malvacearum* (Smith) Dye, the causal agent of bacterial blight. Resistance to the multiple 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. In 2002, wilted plants associated with Verticillium wilt (caused by *Verticillium dahliae*, Kleb.) of Arkot 9315 and SG 105 were less than Arkot 9409 and PSC 355. However, Arkot 9409 had significantly more wilted plants in 2004 than Arkot 9315 and the two checks. In the National Cotton Fusarium Wilt Test at Tallassee, AL, responses of Arkot 9315 and Arkot 9409 to fusarium wilt [caused by *Fusarium oxysporum* Schlect. F. sp. *vasinfectum* (Atk.) Snyd. & Hans.] were equal to the resistant check (Glass et al., 2003 and 2004). In a 2004 greenhouse test, Arkot 9409 displayed higher resistance to seedling disease (caused by *Rhizoctonia solani* Kuehn) than Arkot 9315 and the two checks, while Arkot 9315 displayed higher resistance than PSC 355. In 2003 and 2004, both lines were more resistant to tarnished plant bug (*Lygus lineolaris* (Palisot de Beauvois)) than the susceptible frego-bract check and equal to the check cultivars.

Arkot 9315 and Arkot 9409 had the sixth and ninth highest yields, respectively, of 19 lines evaluated over 11 locations in the 2004 Regional Breeders' Network Test (Table 5). These data suggest that the Arkot 9315 is more widely adapted than Arkot 9409. Lint yields of Arkot 9315 were among the top five entries at five locations (Tallassee, AL, Stoneville, MS, Bossier City, LA, College Station, TX and Idalou, TX) and were among the bottom five at three locations (Hartsville, SC, Mississippi State, MS, and Alexandria, LA). In contrast, Arkot 9409 was not in the top five at any location and was among the bottom five at seven locations.

Table 5. Host plant resistance measurements associated with three Arkot nectariless lines.

	Damaged flowers[1]		**04 Greenhouse[2]**		**Verticillium wilt[3]**		**Fus[4]**
Line	**2003**	**2004**	**index**	**Dead**	**2002**	**2004**	**wilt**
9406-15-04	50	34	6.0	22	29	83	28
9605-17-06	.	30	4.5	17	.	80	.
9631-19-07	.	30	5.9	26	.	69	.
PSC355,ck	50	29	6.1	25	29	69	.
SG105,ck	51	40	5.5	17	24	61	.
Frego bract #1	80	90	.	.	.	.	.
Frego bract #2	91	89	.	.	.	.	.
M-315	.	.	.	.	.	.	10
Rowden	.	.	.	.	.	.	70
LSD0.10	10	9	1.2	ns	ns	12	20

[1] Tarnished plant bug (tpb) test: 6 reps of 2-row plots planted between rows of mustard. Ten white flowers per plot examined for heavy, light, or no discoloration of anthers. Anther damage = (heavy *8) + (light *3) / no. flowers; Damaged squares = (heavy + light) / no. of flowers.
[2] Rhizoctonia test, 3 reps in inoculated greenhouse beds. Index based on ratings of seedlings from 1 (no discoloring of roots) to 9 (dead). Damping-off = % of seedlings that died.
[3] Verticillim wilt: ca. % of plants showing symptoms of Verticillium wilt estimated at Clarkedale.
[4] Fusarium wilt: % dead plants at National Fusarium Wilt Test at Tallassee, AL in 2002.

The combinations of yield adaptation, early maturation, and specific host plant resistance traits of these lines make the lines valuable to cotton breeding programs. Development of the two lines was supported in part by funding from Cotton Incorporated. Small quantities of Arkot 9315 and Arkot 9409 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.

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