Registration of Three Arkot S23 Germplasm Lines of Cotton

Three germplasm lines of cotton (Gossypium hirsutum L.), designated as Arkot S23–1 (Reg. no. GP-855, PI 641161), Arkot S23–2 (Reg. no. GP-856, PI 641162), and Arkot S23–4 (Reg. no. GP-857, PI 641163), were released by the Arkansas Agricultural Experiment Station in 2005. The primary breeding objective associated with these lines was to introduce novel genetic variation from interspecific sources into near-commercial lines of G. hirsutum.

The three lines were derived from a mixed population of germplasm developed by J.M. Stewart. A synthetic allotetraploid was made by hybridization of G. arboreum L. A2–026 and G. armouriannum Kearney followed by doubling of the chromosome number with colchicine. The synthetic allotetraploid was crossed with G. hirsutum ‘Hancock’ and the trispecies hybrid was self-pollinated. Various morphological selections and open-pollinated bulk populations were grown for eight generations in a genetic nursery at Fayetteville, AR (area with high outcrossing). During the 8-yr period the nursery contained other cultivars of G. hirsutum, multiple selections from the trispecies hybrid, and other interspecific hybrid combinations, especially involving G. herbaceum L. Genetic diversity within a line was maintained each year by bulk harvesting a poll from each plant without selection. Beginning in 1995 seeds from nine lines derived from the original trispecies hybrid were bulked, and one cycle of mass selection was performed on an isolated population at the Main Experiment Station at Fayetteville, AR. A second cycle was employed in a planting at Southeast Branch Station at Rohwer, AR (area with low outcrossing), in 1996. Bolls were only harvested from plants possessing plant stature, fruiting, and lint color characteristics consistent with commercially grown cotton. Forty individual plants (designated at S1 through S40) were selected from the segregating population at Rohwer in 1997, and evaluated as progeny rows at two Delta locations in 1998. Nineteen of the 40 were selected and evaluated as advanced progeny in 1999 and 2000. In 2000, 54 individual plant selections were made from four (S03, S08, S21, and S23) of the progeny. Arkot S23–1, Arkot S23–2, and Arkot S23–4 were three of the 15 plants selected from the S23 progeny.

The three lines were included in nine replicated field tests from 2002 through 2004 at four Arkansas Agricultural Research Station sites in the Mississippi River Delta and compared to ‘PSC 355’ and ‘SG 105’. Over all tests, lint yields of the three Arkot S23 lines were similar to the two check cultivars.

Plant heights of Arkot S23–2 and Arkot S23–4 tended to be similar to the check cultivars, while Arkot S23–1 tended to be 6% taller than the other lines. In 2003 and 2004, Arkot S23–2 and Arkot S23–4 had about 75% open bolls at a time when PSC 355 and Arkot S23–1 had about 55%. Over three tests, leaves of Arkot S23–2 (rating = 4.2) were more hirsute than leaves of Arkot S23–1 (rating = 2.7) and Arkot S23–4 (rating = 2.8), based on a rating scale of 1 (smooth leaf) to 7 (very hairy) (Bourland et al., 2003). Arkot S23–1 displays yellow pollen, while the Arkot S23–2 and Arkot S23–4 have cream pollen.

In 2004, the three 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. In a 2004 greenhouse study, all three lines were more resistant to Rhizoctonia solani Kühn (a major seedling disease pathogen) than SG 105, a commercial check cultivar.

Fiber properties of Arkot S23–2 and Arkot S23–4 were similar, with Arkot S23–2–tending to have slightly better fiber than Arkot S23–4. Both lines produced about 2% higher micronaire reading (coarser fibers), 6% shorter fiber length, and 12% weaker fiber strength compared to PSC 355. In contrast, Arkot S23–1 produced 4% higher micronaire reading, 5% weaker fiber strength, and similar fiber length compared to PSC 355. Fiber elongation for Arkot S23–2 (7.6%) was similar to fiber elongation of PSC 355 (7.5%) and considerably higher than Arkot S23–4 (7.1%) and Arkot S23–1 (6.8%).

The three Arkot S23 lines provide nontraditional breeding material with good yield ability because they possess novel genetic variability from interspecific sources. Yield components of the lines tended to be superior to the cultivar checks, but fiber quality traits are less desirable than the checks. Development of the three lines was supported in part by funding from Cotton Incorporated.

Small quantities of Arkot S23–1, Arkot S23–2, and Arkot S23–4 may be obtained for breeding purposes from the corresponding author. 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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References


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