Registration of AGC85, AGC208, and AGC375 Upland Cotton Germplasm Lines

The cotton (Gossypium hirsutum L.) germplasm lines AGC85, AGC208, and AGC375 (Reg. no. GP-860, PI 641928; Reg. no. GP-861, PI 641929; Reg. no. GP-862, PI 641930) were developed by the USDA-ARS and Cotton Incorporated and released in 2005. The lines possess superior fiber length and strength characteristics and improved yield performance under heat stress environments. The lines have been made available to public and private breeders as resources for concurrent improvement of fiber quality and heat tolerance in upland cottons of the mid-south and southeastern United States and as resources for the improvement of heat tolerance in Acala cottons of the southwestern and western USA.

All three germplasm lines originate from the cross of the commercial cultivars ‘FiberMax958’ and ‘SG248’. The pedigree of FiberMax958 is CS68/Siokra S-324//Sicca V-1, and the pedigree of SG248 is Mo 89–117/‘DP 5415’ (Bowman et al., 2005). SG248 had been identified from prior test data as possessing good yield performance in heat stress environments. The cultivar FiberMax958 has good fiber attributes, but its performance is poor under the high temperature environments of the southwestern USA. Individual plants were selected within early generation progeny (F2 and F3) at the low desert location of Maricopa, AZ, in 2001 and 2002. Selection was conducted in two stages within each generation. The selection criterion in the first stage of selection was primarily for fruit retention under a heat stress environment. Fiber samples of selected plants were then analyzed by high volume instrumentation (HVI) in the Fiber Quality Laboratory of Cotton Incorporated, Cary, NC, and the second stage of selection for fiber quality (primarily fiber length and fiber bundle strength) was made among field selected individual plants. In 2003, a total of 70 F2 progeny lines were selected for evaluation in non-replicated tests at Maricopa, AZ, and Tifton, GA, and a subset of 35 lines were evaluated at Shafter, CA. Lines were evaluated for yield performance and fiber quality as determined by HVI and Advanced Fiber Information System (AFIS) instrumentation. Fourteen of the 70 lines tested in 2003 were selected for further evaluation (along with seven parent and check cultivars) in replicated tests at Tifton, GA, Maricopa, AZ, and Shafter, CA, in 2004. FiberMax 958 and Phytogen 72 were included in the trials as high fiber quality checks, and SG747 was included as a high yield performance check. Lines AGC85, AGC208, and AGC375 (tested under the designations FMax958/SG248–08–5, FMax958/SG248–20–8, and FMax958/SG248–37–5, respectively) were selected for release on the basis of overall agronomic and fiber performance across locations.

Averaged over locations, the lint yields of AGC85 (2021 kg ha−1) and AGC375 (1874 kg ha−1) were comparable to that of SG747 (1938 kg ha−1) and superior to the high fiber quality cultivars FiberMax 958 (1651 kg ha−1) and Phytogen 72 (1467 kg ha−1). AGC208 produced a lint yield (1751 kg ha−1) comparable to that of FiberMax 958 (1811 kg ha−1) and SG747 (1938 kg ha−1) and superior to the high fiber quality cultivars FiberMax 958 (1811 kg ha−1) and Phytogen 72 (1467 kg ha−1). AGC208 produced a lint yield (1751 kg ha−1) comparable to that of FiberMax 958 (1811 kg ha−1) and SG747 (1938 kg ha−1) and superior to the high fiber quality cultivars FiberMax 958 (1811 kg ha−1) and Phytogen 72 (1467 kg ha−1).

AGC85, AGC208, and AGC375 generally reflected their relative maturity times, with AGC85 being the latest and AGC375 being the earliest of the three lines.

Ratings of pollen sterility due to heat stress at the Maricopa location in 2004. The rating scale used was as follows: 1 = 100% fertility, 2 = 25% pollen sac nondehiscence, 3 = 50% nondehiscence, 4 = 75% nondehiscence, and 5 = total pollen sterility. Averaged across three dates, lines AGC85 and AGC375 exhibited pollen sterility rates (2.1 and 2.0, respectively) higher than that of SG747 (1.3), but lower than those of the high fiber quality cultivars FiberMax 958 (2.8) and Phytogen 72 (2.7).

Fiber lengths (UHM) of lines AGC208 (28.7 mm) and AGC375 (29.5 mm) were superior to that of the FiberMax 958 parent (25.8 mm) and superior to that of Phytogen 72 (29.5 mm). Line AGC85 exhibited a fiber length comparable to the FiberMax 958 parent. Fiber length of AGC375 (82.2%) was comparable to that of FiberMax 958 (82.5%), whereas AGC85 and AGC208 had fiber length uniformities (83.2%) comparable to that of the FiberMax 958 parent and Phytogen 72 (83.5%). Short fiber contents (HVI) of AGC85 (9.1%), AGC208 (9.3%), AGC375 (9.6%) were similar to that of the commercial cultivar SG747 (9.6%). Line AGC85 exhibited short fiber content (8.8%) comparable to that of the FiberMax 958 parent (9.1%) and Phytogen 72 (8.1%). Fiber bundle strengths (cN) of AGC85 (32.9 cN) and AGC375 (33.6 cN) were slightly weaker than that of the FiberMax 958 parent (34.1 cN). The fiber bundle strengths of AGC208 (34.0 cN) were comparable to that of the FiberMax 958 parent (34.1 cN). Fiber elongations of AGC85 (3.3%), AGC208 (3.3%), and AGC375 (3.4%) were lower than that of the cultivars SG747 (4.0%) and Phytogen 72 (4.0%). The fiber elongation of AGC208 and AGC375, exhibited fiber strength comparable to that of the FiberMax 958 parent. Fiber fineness of AGC85 was superior to that of the FiberMax 958 parent (5.30 mtex) and AGC375 (5.33 mtex) were all lower than that of SG747 (5.50 mtex) and Phytogen 72 (5.50 mtex). Fiber fineness of AGC208 was lower than that of the high fiber quality cultivars FiberMax 958 (5.10 mtex) and Phytogen 72 (5.10 mtex).

Small quantities of seed (25–50 g) are available to cotton breeders, geneticists, and other research personnel on written request to the corresponding author or R.G. Cantrell for at least 5 yr. Requests for seed from outside the USA must be accompanied by an export permit allowing entry into the requestor's country. The USDA-ARS and Cotton Incorporated may not be able to certify that seed is free of certain insects or pathogens specified on import permits, and in such cases seed will be accompanied by an import permit allowing entry into the requestor's country. The USDA-ARS and Cotton Incorporated have made reasonable efforts to ensure that seed is free of adventitious transgenes. The frequency of seed containing these promoter sequences was very low (0.23%, 0.16%, and 0.70%, respectively, at the 95% confidence range), but there is a slight possibility of adventitious transgene contamination. It is requested that appropriate management practices be followed to ensure that seed of AGC85, AGC208, and AGC375 does not contain an adventitious transgene. It is requested that appropriate management practices be followed to ensure that seed of AGC85, AGC208, and AGC375 does not contain an adventitious transgene.