GENETIC DIVERSITY IN RECENT MAR COTTON GERMPLASM

Kamal M. El-Zik and Peggy M. Thaxton
Texas A&M University
College Station, TX

Abstract

The importance of genetically distant parents to cultivar improvement has been established. Genetic diversity and variation between parents is important in creating new superior cultivars with unique and new gene combinations. Extensive use of closely related cultivars by growers could result in vulnerability to insects, pathogens, and abiotic stresses. Recent reports indicate a decline or slow down in the rate of yield increase, which is attributed to a decrease in useful genetic variability within breeding program. Several researchers concluded in recent studies that the genetic base of modern upland cotton cultivars is not particularity narrow and continue to offer opportunities for cultivar development. Their studies highlighted the contribution of several individual breeding programs to genetic diversity of cotton.

Both adapted and exotic cotton lines are useful for introgressing into germplasm. The MAR germplasm began with a diverse gene pool which included strains with genes for bacterial blight resistance (*B* genes) transferred from *G. barbadense* and *G. hirsutum* to upland cotton. It also included genetic stocks with resistance to Fusarium wilt/root-knot nematode complex and southwest cotton rust. Other germplasm included Empire WR, Texacala, Lankart 57, Blightmaster, Paymaster 105, and Deltapine smooth leaf.

Currently, the MAR program introgresses only adapted germplasm. Germplasm introductions from the USA include the Acala SJ from California, CA from Texas Agricultural Experiment Station at Lubbock, Acala cultivars from New Mexico, PD lines developed by T. Culp, USDA-ARS, SC, germplasm developed by R. Shepherd, USDA-ARS, MS, and Paymaster 145 and Stoneville 506. The Acala's, Lubbock and the New Mexico germplasm contributed to fiber quality and resistance to Verticillium wilt, PD to fiber quality and the Shepherd germplasm to root-knot nematode resistance. Introductions from outside the USA included Bouake from Central Africa, Pora Inta and Chaco Inta from Argentina, Victoria and Christina from Spain, and the okra leaf cultivar Siokra from Australia. The material from Argentina contributed to higher levels of resistance to insects and improved fiber quality. Recently new introductions include Carant from Spain, HR U585-12 from the Ivory Coast, Nazilli from Turkey, Reba P279 from Africa, and Rega 5 from Paraguay.

Before parental material is intogressed into the MAR germplasm, it is screened using the MAR procedures. However, selection pressure is not as stringent as with the MAR germplasm. New selected parental strains are crossed to the most advanced MAR germplasm. After crossing, selected strains become part of the main MAR gene pool. The established MAR techniques and procedures utilize seed, seedling, and plant selection in the laboratory and greenhouse, followed by extensive four-stage field testing and evaluation at ten locations throughout Texas, from the Rio Grande Valley to the High Plains. These procedures make it possible to identify superior cotton strains with genetic gains to many important traits.

The MAR program has released germplasm lines that included introgression from different sources. The MAR-5 CDP37HPIH-1-86 and MAR-6 CAHUGARPIH and CD3HHARCIH were developed from Pora Inta and Chaco Inta lines. MAR-6 lines, BLCABPD86S and MAR5PD208S had contributions from the PD High Quality strains, and LBBCDBOAKH with Bouake contribution. New MAR-7A releases with introgressions include four glabrous strains: LBCBHGDPIS, CUBQHGRPIS, PD23CD3HGS, PD24LB2HGS; and four hairy strains: CBD3HGDPIH, CDARCILBCHN, CDRCIQCUBH, and CUBQHGRPIH. The new elite MAR germplasm releases will combine high yield potential and early maturity, improved fiber and seed quality, drought tolerance, higher levels of resistance to insects and pathogens, and stability over diverse environments benefitting cotton growers and industry.

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