

Beltwide Cotton Conferences
January 8-11, 2008
Gaylord Opryland Resort and Convention Center
Nashville, Tennessee

Recorded Presentations

Friday, January 11, 2008 - 9:45 AM

Comparison of the Efficacy of the Bispecific and Trispecific Pathways to Exploit Australian Wild Diploid Species for the Genetic Improvement of Upland Cotton

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In order to determine the most efficient approach to exploit the genetic diversity of Australian wild diploid species for the genetic improvement of *Gossypium hirsutum*, the introgression results obtained through the creation of trispecific and bispecific hybrids involving respectively *G. sturtianum* and *G. australe* were compared. The creation of triple hybrids using a D-Genome species as bridge is interesting because in such allotetraploid combinations the A_h chromosomes have no auto-syndetic partners and have to pair with the chromosomes of the Australian donor species. However, a very large effort is required to produce fertile progeny and to eliminate the undesirable genetic material contributed by the diploid donor and bridge species. The frequency of homologous recombination between the Australian donor species chromosomes and the A_h - or D_h -Genome chromosomes is globally lower in bi-specific than tri-specific derivatives but the effort necessary to produce fertile progeny in the former is globally less important if the pentaploid is sufficiently male fertile to be backcrossed to *G. hirsutum* as male parent. In this situation, the bi-specific pathway offers the possibility of generating more progeny in the same amount of time and thus to capture more homologous recombination events. Moreover, in direct exploitation of bi-specific hybrids through backcrossing the hexaploids to *G. hirsutum*, recombinant chromosomes are more likely to be incorporated into fertile plants. This last method has also the advantage of allowing some control of the intensity of genetic exchanges in interspecific hybrids at the hexaploid and monosomic addition stages. The choice of the best hybridization scheme also depends of the genetic determinism of the trait to be introgressed. Bispecific hybrid are more convenient for the introgression of characters controlled by genes located on a single chromosome while triple species hybrids permit more easily the capture of traits controlled by genes located on several chromosomes.