

## **F1 COMBINING ABILITY FOR YIELD IN THE MS DELTA AND CALIFORNIA**

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### **Abstract**

Phytogen Seed Co., LLC has engaged in basic research to ascertain the combining abilities of parental breeding lines and whether or not these combining abilities are predictive of genetic gain in subsequent breeding efforts. Thirty-six (36) F1 “diallel” crosses were made in India as the set of all possible crosses between a diverse group of nine varieties. The parents were comprised of three groups: 1) early maturity Upland varieties - PSC 355, SG 747, and FM 958, 2) later maturity Upland varieties - DP Pearl, FM 966, X-6348 (experimental Argentine line), and 3) San Joaquin Valley, CA [SJV] Acala varieties - PHY 72, GTO, DP 6211. The 36 F1’s were tested during 2001 in a 3-rep, 2-row field test at five field locations near Leland, MS; St. Joseph, LA; Marianna, AR; Waukena, CA; and Stratford, CA. The parents were included in the tests at the MS and CA locations in order to determine heterosis. Since the GxE term in the overall ANOVA was significant, lint yield was analyzed separately for each location using the Diallel procedure (Method 2 or Method 4) of Agrobases 20. The general combining ability (GCA) term was significant for all locations except Stratford, CA, while the specific combining ability (SCA) term was significant at only Stratford, CA and MS. In MS, the parents with the highest GCA for yield were DP Pearl, FM958, and PSC355 and those with the lowest GCA were the Acala varieties PHY72, DP6211, and GTO. The low GCA of Acala varieties in MS was expected, but, surprisingly, PHY72 combined particularly well with DP Pearl and PSC355 as these crosses had the highest SCA. Indicating apparent genetic similarity between their parents, the GTO/DP6211 and FM958/FM966 crosses had the lowest SCA at MS. In AR, PSC355 and DP Pearl had the highest GCA while GTO and DP6211 had the lowest. In addition to having the highest GCA at AR, PSC355 has demonstrated exceptional yield potential at this AR location. At LA, PSC355 and FM966 had the highest GCA and, like the other two Delta locations, DP6211 and GTO had the lowest. Averaged across the Delta locations, PSC355, DP Pearl, and FM966 were the best combining Upland parents while PHY72 was the best combining Acala parent. There was significant verticillium wilt pressure at the Waukena, CA location that significantly increased the error variance. Even with a CV of 17.7%, the GCA term was still significant due in large part to the high GCA of GTO and PHY72 and to the low GCA of SG747, FM958, and X-6348. These results may be more indicative of combining ability for wilt tolerance than for CA yield potential. Even though the GCA term was not significant at the Stratford, CA location, GTO combined well with FM966, SG747, and FM958 while DP6211 combined well with DP Pearl and X-6348 as indicated by high SCA. At MS, the Upland X Upland crosses exhibited an average of 10.5% heterosis for yield. Interestingly, the cross of X-6348 onto PSC355 and DP Pearl resulted in the greatest heterosis as these crosses yielded 26.0% and 21.3% more than their respective best parents. At Waukena, CA only four crosses yielded more than their best parent. At Stratford, CA, the Upland X Acala crosses on average exhibited 6.6% heterosis with GTO/SG747, GTO/FM958, and GTO/FM966 having the highest heterosis at 13.5%, 13.3%, and 18.2%, respectively. These results indicate that further research on combining abilities and early generation testing is warranted.