A delay in fertilization is usually the first indication that one is dealing with an incompatible cross. Other factors associated with incompatible crosses are reduced embryo and endosperm growth, and hyperplasia of the nucleus and inner integument. It seems that in these hybrid crosses, the nutrient supply is shifted from the developing embryo to the maternal tissues of the ovule.

Cotton ovule culture is being utilized in the transfer of caducous bract from a wild lintless diploid species to commercial cultivars. With this technique, the ovule is removed from the influence of the mother plant at an early stage of development (3-10 days post-anthesis). Vitamins, hormones, and essential nutrients are supplied to the ovule in a pool of sterile liquid medium. The ovules are able to grow normally in this medium for 4-6 weeks. After this time, ovules are carefully dissected to reveal hybrid embryo development. The hybrid embryos are removed, and placed in a new medium which allows germination. In 3-4 weeks, embryos are usually large enough to be transferred to soil.

Although success, to date, is limited, and there are still some problems with ovule culture in cotton, new developments and techniques will allow for higher percentages of success. Ovule culture does allow us another method of producing hybrids between wild species and the cultivated cottons. Cotton breeders will certainly rely on this technique much more in the future.

Cytology and Genetics

J. E. Endrizzi and G. Ramsay

1. Cytogenetic analysis of ob Y_2 marker genes and chromosome 18

In 1979 we had established in monosomic tests that the ob Y_2 loci were located on chromosome 18 and that the two markers were 1.24 + 0.62 map units apart. Russ Kohel has reported a recombination value of 18% between these two markers. The ob Y_2 linkage group used here in Arizona came from transferrence of the Y_2 and ob from G. darwinii to G. hirsutum and therefore may have contained an extensive segment of G. darwinii chromatin which could have reduced recombination in that segment.

Analysis with monotelodisomics of chromosome 18 showed that the ob locus was located in the short arm of this chromosome and 1.25 $\pm$ 0.62 map units from the centromere, which is the same recombination value as in the disomic or normal 26 bivalents. The Y_2 locus did not segregate; thus these data indicate that the Y_2 locus is located either in the long arm or the short arm and tightly linked with the centromere. The analysis of 72 F_2 plants involving the F_1 of telo 18L suggested also that the Y_2 locus could be located in either arm and very close to the centromere.

In view of the possibility that Y_2 was tightly linked with the centromere and may only rarely undergo recombination, a study was set up with monosome 18 to determine the arm location of Y_2.

This was accomplished by crossing Ob Y_2 to mono 18. From such a cross, the disomic plants would have the heterozygous genotype of ObY_2/oby_2, whereas the monosomic 18 plants would have the hemizygous genotype of Ob Y_2/O.

Since monosomic chromosomes will occasionally misdivide during either the first or second meiotic division, it is possible to determine the arm location of Y_2 by recovering the misdivided or telocentric chromosomes in the outcrosses of monosomic 18 Ob Y_2/O to ob y_2.

Two types of telocentric chromosome can be recovered from misdivision of a single chromosome, one that is telocentric for the short arm and the other that is telocentric for the long arm. In case of mono 18 Ob Y_2, if Y_2 is in the short arm along with ob the F_1 monotelodisomic for the short arm should have the Ob Y_2 genotype like the disomes and the F_1 monotelodisomics for the long arm should have the ob y_2 genotype like the monosomes. However, if the Y_2 locus is in the long arm, the F_1 monotelodisomics for the short arm should have the genotype of Ob y_2 and the F_1 monotelodisomics for the long arm should have the ob Y_2 genotype. As shown in Table 1 these latter results were obtained proving that the Y_2 locus is in the long arm. All plants with the Ob y_2 and ob Y_2 genotypes were analyzed cytologically and, with one exception, all had the cytotype that corresponded to the marker phenotype, i.e. the plants with the Ob Y_2 phenotype were normal and had 26 bivalents, those with the ob y_2 phenotype were monosomic, those with the Ob y_2 phenotype were monotelodisomics for the short arm, and those with the ob Y_2 phenotype were monotelodisomics for the long arm. The exceptional plant was one with the ob Y_2 phenotype and instead of having a telocentric for the long arm, it had an isochromosome for the long arm. This cytotype is expected to have the same phenotype (ob Y_2) as the telocentric for the long arm since the short arm is deficient in both cases.

A second cycle of testcrosses with the monotelodisomic F_1's have been made for a second estimate of recombination between the loci and the centromeres.

Table 1. Genotype and cytotype of progeny recovered from crossing B24-1980 H18 O/Ob Y_2 x ob y_2 AG207 H7A-1980

	Genotype and Cytotype				
	Ob Y_2 26"	ob y_2 25" 1'	Ob y_2 ———	ob Y_2 ———	Total
Number Plants	256	184	9	7[1]	456

[1]One plant = 25" + univalent and iso for long arm of H18.
% transmission n-1 = 40.35
% recovery of misdivisions = 3.51

2. Genetic study of a necrotic-leaf-spot mutant

In 1977 Dr. L. S. Stith found a line of Delcott 277R that was segregating for a necrotic type of leaf spotting. The spots normally start out as small reddish areas on the leaf and gradually increase to 20-25mm in size. As the spots increase in size, the color usually changes from red to purple and to very dark purple or black, consisting of a large necrotic area. The spots appear only on the more mature leaves, and their frequency increases as the plants attain maturity. Thus, by August the plants having the necrotic spots are quite conspicuous. Self-pollinated seed of 9-9-4-77 was obtained from L. S. Stith for cytological and genetical study.

Delcott 277R is an Upland cotton with the G. harknessii cytoplasm and restorer gene developed by the late Dr. Vesta Meyers. Ten plants were grown from self-pollinated seed of a single boll of 9-9-4-77 and all expressed the necrotic leaf spots of flecks. One plant was analyzed cytologically and found to contain only 26 bivalents. The second of S_2 generation also bred true for the necrotic spot character but it was noted that the plants varied in their expression of fertile and sterile anthers.

An S_2 plant was crossed as female to TMI to study the inheritance of the leaf spotting character. Twenty-seven F_1 plants (H17-1980) were grown and all were free of the necrotic spots and highly male sterile. The F_1 were crossed as females to both TMI and to necrotic leaf spot (H16B-1980) plants. Two F_1's were ratooned to obtain self-pollinated seed in the greenhouse. These plants are normally sterile under field conditions, but will produce some viable pollen under greenhouse conditions. Results of the segregating populations are given in Table 2.

Table 2. Genetic analysis of a necrotic-leaf spot or fleck in Delcott 277R

	Normal	Necrotic
F_1 (necrotic x TM1) x necrotic	66	67
F_1 (necrotic x TM1) x TM1	18	0
F_1 (necrotic x TM1) S	125	41

The testcross segregated in a near perfect 1:1 segregation of normal to necrotic-leaf spot (x^2 = .007, P = .95-.90). Only normal plants were recovered in the testcross with TM1, indicating that the necrotic symptoms are recessive, which was confirmed by the F_2 populations. Here, the segregating ratio of normal to necrotic leaf plants gave a very good fit to a 3:1 ratio (x^2 = .012, P = .95-.90). In conclusion, these data show that necrotic-leaf spot of Delcott 255R is due to a single recessive gene.

Summary of Short Staple VAriety Trials
1981
Yield of Lint/Pounds per Acre

VARIETY	Mohave Valley	Mohave Valley	Stanfield	Casa Grande	Poston	Gila Bend	Buckeye	Willcox	Solomon	Marana
DP-41	1092	1441	2100	1272	1629		1209	481	1173	861
ST-825	1041	1227	2009	1390	1333	1322	1314	575	1191	813
DP-70	994	1157	2081	1302	1585		1283			
ST-506	982	1240					1179	495	1190	823
DP-61	934	1214	1871	1283	1326	1305			1227	
MN-235	718	1293			1284		1085		1162	
DP-90			2190	1461	1495	1216			1465	683
DP-643N					1451				1167	
DP-120					1359		1445		1410	
DP-62			2156		1230	1364	1077		1174	
DP-733			2006							
MN-220								571	1129	
L7								505		
MN-307								492		
ST-302								483		
DP-55										927

Short Staple Variety Comparison

Jim Armstrong, Pima County Extension Agent

New varieties of upland cotton are constantly being released. Growers are altering cultural practices in an effort to reduce cost and/or increase profit. This makes it imperative to generate knowledge and information relative to performance of new varieties under given conditions and in comparison to standard varieties.

The following reflects the efforts of this office in this worthy effort.

Short Staple Variety Comparison
Evco Farms, Art Pacheco, Marana

VARIETY	First Pick Lint/A	First Pick Price	First Pick Value	Second Pick Lint/A	Second Pick Price	Second Pick Value	Total Value Per Acre
DPL 55	911	.555¢	$505.61	22	.493¢	$10.85	$516.46 a [1]
DPL 41	856	.5715¢	$489.20	20	.493¢	$ 9.86	$499.06 a
St 825	842	.5585¢	$470.26	11	.493¢	$ 5.42	$486.68 a
St 506	819	.5614¢	$459.87	19	.527¢	$10.01	$469.88 a
DPL 299	638	.585¢	$373.23	26	.493¢	$12.82	$386.05 b

[1] Values followed by the same letter not significantly different at .05 level by the Student - Newman - Keul's Test.

Crop History

SOIL TYPE:	Sandy Loam Previous Crop: Upland Cotton
Land Prep.:	Plow, landplane and list
Planting Date:	4/30/81 drilled under cap in 40 inch rows
Herbicide:	1.6 lb. NH_2 water run and 43 lb. Uran
Irrigation:	Preirrigation 4/9/81 - 4/15/81 - 1.4 AF - Five irrigations alternate rows Terminal 9/14/81 - Total Water Applied 3.82 AF
Insecticide:	3 applications for, Perforator, Lygus and Cotton Bollworm
Defoliation:	2 gal. Sodium Chlorate on 10/4/81
Harvest:	First pick 10/20/81, second pick 12/7/81