

COTTON FOR HIGH FIBER STRENGTH

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Abstract

My cotton breeding career started at New Mexico State University in 1960. My work has always been done under conditions of voluntary one-variety districts, New Mexico and Texas (1960 - 1964), the one-variety district by law in the San Joaquin Valley of California (1964 - 1978), and the San Joaquin Valley one quality district (1979 to present). Growers and Mills have always been involved in variety decisions in these areas. The growers desiring improved yields and quality, and the mills desiring improved fiber and spinning properties.

Cotton is an amphidiploid and the chromosomes are not well marked. Simple genetic models will not solve the complex inheritance of traits involved in cotton variety development.

The breeding, selection, and evaluation procedures used were established in the 1960's. Workers who assisted me were New Mexico State University staff, Glen Staten, Roy Wood, John Porter, and John Cotton (USDA-ARS-NMSU), Dr. Charles Lewis, Dr. Tom Kerr, Dr. Billy Waddle and John Turner who were all USDA-ARS employees. I spent considerable time discussing and establishing these procedures. All of these people made significant contributions to my schemes. Many industry leaders and textile representatives also made significant contributions on evaluation procedures. These procedures provide for simultaneous selection, and the accumulation of all desirable traits in a single cotton.

I introduced cottons which had desirable traits but lacked the complete balance, i.e. high levels of Verticillium wilt tolerance but late in maturity and vegetative, or high fiber strength with low elongation. These cottons are evaluated for use in the breeding program.

The applied breeding phase of the program was where germplasm lines were intercrossed with introduced breeding lines, varieties, and advanced strains. This provided for the mixing of the DNA, tested combining ability between lines and provided new combinations of traits. The crosses were grown in Mexico in the Winter Garden to produce a new round of segregating material. Pedigreed plant-to-row selection was practiced from the F2 through F5 and a limited degree beyond the F5 generation. Each individual plant selection was evaluated for all observed traits and

tested in the laboratories for ginning, fiber and seed properties.

Cotton Testing Scheme: Three stages of replicated testing were used.

1st Stage - Lines Tests. Evaluated Progeny rows

2nd Stage - Preliminary Strains Test

3rd Stage - Advanced Strains Test

The scheme of varietal development was used to develop germplasm bases or combinations from which several improved varieties have been developed by me from 1960 to date. The germplasm bases are shown with varieties listed. Cottons developed by Dr. G. N. Stroman and Glenn Staten and co-workers at New Mexico State University have contributed significantly to the development of the California high strength, high fiber quality, Verticillium wilt tolerant cottons.

Pedigrees of the cottons are shown in Figure 1.

- 1) Acala SJ-1 - 1967. John Turner, USDA-ARS developed the germplasm base.
- 2) Acala SJ-2 - 1973. Cooper's scheme was employed to further evaluate Turner's germplasm and this resulted in the release of Acala SJ-2.
- 3) Acala SJ-3 - 1974. This variety was developed from the first genetic base developed. It provided some relief from damage due to Verticillium wilt yielding 9.7% more than Acala SJ-2 under severe wilt conditions.
- 4) Acala SJ-4 - 1975 and Acala SJ-5 - 1977. These varieties were developed from my second genetic base. Acalas SJ-4 and SJ-5 under severe wilt conditions exceeded the yield of Acala SJ-2 by 13% and 17%, respectively. The yield of Acala SJ-2 was slightly greater, 3 to 4%, under non wilt conditions.
- 5) Acala SJC-1 - 1982. My third genetic base produced an advanced USDA strain T8296. The USDA_ARS terminated the Applied Cotton Breeding project at the US Cotton Research Station, Shafter, California in 1977. The strain T8296 in addition to all other breeding stocks was released to the public in 1979.
- 6) Prema - 1989. My fourth genetic base produced this variety. Prema produced fine, long, uniform, and strong fiber. The fiber strength of Prema was 19% greater than Acala SJ-2. The

carded and combed yarn strengths were 38% and 34% greater than SJ-2.

- 7) Acala Maxxa - 1990. My fifth genetic base produced this variety. It yields equal to Acala SJ-2 under non wilt conditions but significantly above Acala SJ-2 and GC-510 under wilt conditions.
- 8) Acala Royale - 1990. My sixth genetic base produced this variety. The latter three cottons were released by the California Planting Cottonseed Distributors after I left.

Dick Bassett's data show that the yield due to breeding has increased approximately 8.5 lbs of lint per acre per year since the mid-1939 to 1979. The data presented show that steady improvements can be made over years while maintaining and / or improving fiber quality and improving wilt tolerance.

If we include Paymaster HS-26 and DPL-90 in our calculation of bales which have been produced which had NM Breeding lines produced by Glen Staten and Company, the total would be well over 200 million bales.

It has been a "hell'va" ride.

<u>GA</u>	<u>CA</u>	<u>NM</u>	<u>LA</u>	<u>TX</u>
Triple Hybrid x	C6	NM1517	NM7378	Coquette ¹ E364
Early Fluff (TE)	A51	NM2503	NMB3080	
		NM2302	NM1900-1	
		NM49-2		NM7403

1. (Acala 51 x TE) → ATE1 x NM2302 → Acala SJ-1, Acala SJ-2, 12302-4 and S196 (USDA)²
2. (C6 x TE) → C6TE x NM7378 → Acala SJ-3 (USDA)
3. C6TE x NMB3080 → Acala SJ-4 and SJ-5 (USDA)
4. (C6TE x NMB3080) x (Acala 4-42 x NM7403) → Acala SJ-1 (CPCSD) and GC510 (Germain's)
5. (Acala 51 x TE) → (ATE11 x NM49-2) x (C6TE x NMB3080) → Prema (CPCSD)
6. (S196 x NM1900-1) x [12302-4 x (C6TE x NM7378)] → Maxxa (CPCSD)
7. (C6TE x NMB3080) x (ATE1 x Tex E364) → Royale (CPCSD)

Figure 1

¹Coquette: One parent in NM7378 (1)

²Breeder of variety (CPCSD = California Planting Cotton Seed Distributors)