# COTTON VARIETY TESTING RECOMMENDATIONS Daryl T. Bowman, Professor North Carolina State University Raleigh, NC

### <u>Abstract</u>

An ad hoc committee of the Southern Regional Information Exchange Group (SRIEG-61) dealing with cotton breeding has recommended a list of practices and procedures to follow in conducting valid cotton variety trials. The recommendations address: plot size dimensions, replicate number, experimental design, statistical analyses, sampling, pesticide use, data collection and reports.

#### **Introduction**

Variety testing is an important activity conducted by various state agencies where cotton is grown. Results of the variety tests are used by breeders, seed salespersons, extension agents, consultants, and ultimately the growers. It is critical that variety trials be conducted in a manner consistent with modern scientific methods, grower practices, and an unbiased approach. The Southern Regional Information Exchange Group (SRIEG-61) entitled 'Cotton Germplasm: Acquisitions, Evaluation, and Utilization' established an ad hoc committee to examine cotton variety testing practices and make recommendations. Committee members included Shelby Baker, Fred Bourland, Daryl Bowman, David Guthrie, Steve Oakley, Richard Sheetz, and Michael Swindell.

The committee surveyed the cotton industry on testing techniques in the fall of 1994. Survey results were presented at the 1995 Beltwide Cotton Conference (Bowman, 1995). Based on the survey results and several discussions the following recommendations were made:

#### **Recommendations**

Item Production practices (e.g. irrigation, growth regulators)	<u>Recommendation</u> Follow standard production practices in the area
Plot size: # rows # harvest rows row length	Minimum two rows unbordered Minimum two rows unbordered Minimum two rows of 40' (Keisling and Smith, 1994)
Test border rows	Minimum 2 side border rows
Stand correction	Skips should be adjusted; either skip distance from tip of plant to tip at end of season or skip distance minus 3' for early season stem to stem measurement (Pope, 1947).

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Boll samples	Minimum 2 replicates sampled , if using pulled samples then minimum 25 bolls
Seeding rate	Up to individual but uniform stands in terms of population
In furrow insecticide	Recommended
In furrow fungicide	Recommended
Boll opener	Recommended for once-over harvest
Number of harvests	Up to individual
Experimental design	Minimum complete block design with all replicates randomized
Number of replicates Statistical analyses	Minimum 3 Minimum anova (analysis of variance)
Lint percent calculations	1 per replicate sampled
Fiber samples	Minimum 2 replicates analyzed
Data reported	Lint yield, lint %, maturity measure, plant height, fiber length, strength, uniformity index, elongation; and storm proofness where appropriate
Statistics report	Minimum analyze lint yield, report mean, r <sup>2</sup> , LSD, and SE
Probability level	0.10
Data reporting format	By location and by location across years
Maturity measure	Some measure recommended
Maturity division	Divide test by maturity using Deltapine 51 or a benchmark/standard variety as the dividing line

All practices followed (i.e. chemicals used, time of defoliation, date of planting and harvest, etc.) and any unique weather, insect, or disease problems should be reported along with the data.

For statistical analyses, the iterated nearest neighbor analysis is not recommended due to the possibility of underestimating true error. The LSD should be reported whether the 'F' test was significant or not; the size of the LSD is another measure of precision and the 'F' test does not indicate significance of every possible combination of entries, only the average.

There is no one statistical measure that can be exclusively used to indicate validity or a minimum reputable test. All statistical measures have one or more flaws. The adjusted  $r^2$  [(1-error ms)/total ms] has the fewest flaws but can be influenced by the uniformity of entries in the test, i.e. more diversity will result in higher and more desirable adjusted  $r^2$ values. The cotton community is encouraged to examine statistical parameters other than the CV for a measure of validity.

Issues related to the testing of transgenic cotton varieties were not addressed. After initial experience with testing

both herbicide and insect resistant cotton varieties, standard practices and procedures will be examined at a future date.

## **References**

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Keisling, T. C., and C. W. Smith, 1994. Research plot lengths for spindle harvested cotton. Commun. Soil Sci. Plant Anal. 25:2981-2988.

Pope, O. A. 1947. Effects of skips or missing row segments on yield of seed cotton in field experiments. J. Agric. Res. 74:1-13.