

**COMPARATIVE GROWTH OF OBSOLETE AND MODERN COTTON CULTIVARS:
YIELD, FIBER QUALITY AND CARBOHYDRATE DYNAMICS**

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Abstract

Historical yield records show a potential yield and fiber quality plateau for cotton. This study was conducted to determine if cotton is at a yield and fiber quality plateau because of genetic limitations and to investigate potential genetic improvement that elite lines have over modern varieties. Secondary objectives were to identify obsolete lines with superior fiber quality for application in cotton improvement and to determine if genetic limitations are related to lower stem and root carbohydrate levels. Treatments consisted of 23 obsolete varieties collected from the USDA Cotton Germplasm Collection, 24 commercially available varieties, and 6 elite lines obtained from two of the leading private breeding programs. All treatments were replicated four times in a RCBD. Lower stems and roots were collected from 5 plants at first bloom and cutout, and starch content was determined via the Hendrix method. Plots were machine harvested, and samples of certain varieties were box mapped. Regression analysis on yield and release date revealed a 9.76 lb increase in lint for every year of breeding since 1920 ($r^2=0.82$) and a 19.4 lb increase since 1975 ($r^2=0.66$). Regression analysis of micronaire and release date showed a substantial improvement in micronaire since 1995 ($r^2=0.69$). Box mapping data revealed that elite lines produced fewer bolls than current varieties, but these bolls are larger. Elite lines produced larger bolls throughout the fruiting profile. Moreover, elite lines appeared to produce an early, compact boll load. Statistical analysis on fiber quality showed that obsolete varieties Trice, Empire, and Auburn 56 have superior micronaire. Regression analysis on lower stem carbohydrate levels and yield revealed that lint per acre increased with lower stem carbohydrate levels ($r^2=0.51$). Thus, lower stem carbohydrates are not a limiting factor in lint production. To conclude, yield and fiber quality have been concurrently improved with elite lines. More effort seems to have been placed on micronaire improvement since 1995. Plant carbohydrate levels are not related to lower yields or poor fiber quality.