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Relationships Between Micronaire, Fineness, and Maturity. Part I. Fundamentals

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Micronaire has been used as a substitute for assessing cotton (*Gossypium hirsutum* L.) fineness and maturity when these measures are not available. Variability in R^2 between the paired fiber properties (micronaire and maturity, micronaire and fineness, and maturity and fineness) has been observed. There is a need to model the relationships between these variables to understand the changes in R^2. The objective of this study was to develop and compare models between micronaire, fineness, and maturity in terms of the cross-sectional dimensions of wall thickness and perimeter. The models were computer simulated over the full range of thickness and perimeter values, the simulated data plotted, and the relative sensitivity to changes in thickness and perimeter calculated. Families of lines were produced by plots of wall thickness at constant perimeter versus micronaire, fineness, and maturity, and by plots of micronaire versus fineness and maturity. The paper evaluates R^2 values that would be obtained if the various relationships were fitted using a simple linear model. Additionally, the micronaire model is significantly more sensitive to a change in wall thickness (in μm) compared with the same change in perimeter, especially at small thickness values where micronaire is almost independent of perimeter. As thickness increases, i.e., for high micronaire cottons, the sensitivity to perimeter becomes larger. These simulations show how wall thickness and perimeter together affect fineness, maturity and ultimately micronaire.