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DEVELOPMENT OF NIST - TRACEABLE HVI COLOR MEASUREMENTS

Devron Thibodeaux and Jacqueline Campbell
USDA, ARS, SRRC
New Orleans, LA
James Knowlton
USDA, AMS, Cotton Program
Memphis, TN

Abstract

With the demise of the U.S. textile industry, U.S. cotton producers must increase their efforts for global marketing of their fiber. Since U.S. cotton is marketed based on HVI, our global customers are beginning to question HVI standards since they are based on AMS reference cottons, not on scientifically recognized standards such as those from NIST (National Institute of Standards and Technology). The objective of the present work is to demonstrate the feasibility of relating HVI color measurements (HVI uses the cotton colorimeter to measure reflectance (Rd) and yellowness (+b)) to a laboratory instrument calibrated with NIST- traceable color standards. The approach was to obtain a total of ten reference tiles and twelve reference cottons that have been measured for Rd and +b on the AMS master cotton colorimeter. These same objects were then measured on a GretagMacbeth laboratory spectrophotometer calibrated to the CIELAB color system with a NIST-traceable standard.

Relationships between the HVI (Rd,+b) and the CIELAB (L*,b*) were examined and are reported herein. In Figure 1 the relationship between Rd and L* for calibration tiles and cottons measured on the HVI Master Colorimeter and the GretagMacbeth laboratory spectrophotometer. Results from both the ten tiles and twelve cottons fall on the same line with a good coefficient of determination (R^2 = 0.9302), a significantly non-unit slope (1.892) and non-zero offset (46.64). A comparison of +b with b* for the same tiles and cottons (Figure 2) shows an excellent coefficient of determination (R^2 = 0.9565), a near-unit slope (1.075) and small offset (-0.444).

Summarizing, allowing for differences in slope and offset, very good correlations were found between the standard CIE color parameters (L*, b*) and the master colorimeter's (Rd,+b), respectively. As a result of this preliminary study we can conclude that it is feasible to trace HVI color measurements to a laboratory spectrophotometer calibrated to the CIELAB color system with a NIST-traceable standard.

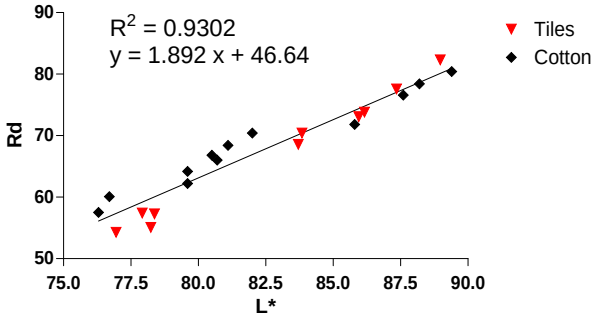

Figure 1. Correlation between Rd and L* for calibration tiles and cottons measured on the HVI Master Colorimeter.

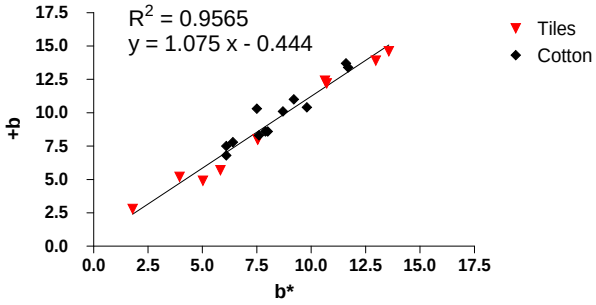

Figure 2. Correlation between +b and b* for calibration tiles and cottons measured on the HVI Master Colorimeter.