Tomato Scores

Background

Color is often used as an indication of quality and freshness for food products, including tomato products for which the perception is "the redder the better." It has become important for tomato processors to be able to evaluate and grade their products based on color.

In the past, the color of tomato products was measured subjectively. Often a Maxwell Disk Colorimeter was used. The tomato product to be measured was compared to the spinning disk containing red, black, and yellow areas. The amounts of each color on the disk were varied until the color of the spinning disk matched that of the product. The percentage of each color on the disk was then recorded to specify the color of the product. The results of this type of test were very inconsistent. As a result, the tomato processing industry decided that they needed a more objective method for measuring the color of various tomato products that would provide a more consistent means of evaluating and grading tomato color and quality.

Objective colorimetric methods have been developed based on tomato paste standards prepared by the University of California at Davis (UCD). Each user prepares this standard in the specified manner and hitches their instrument to it. Then the user assigns values to their tomato tile based on that hitch. After that they can use the tile to standardize their instrument for taking measurements that correlate to the tomato paste standards. The samples are prepared as prescribed by UCD and placed in glass sample cups. All of the cups used are to be purchased from the same supplier so that the calibration values will not be significantly different among the cups. They are to be calibrated as specified by UCD or sent to UCD for calibration. A line is to be drawn on each cup at the time of selection for use so that the same depth of product is measured each time. An opaque light shield is to be used when measurements are taken to prevent ambient light from interfering with the measurement.

In July 2003, the United States Department of Agriculture (USDA) approved HunterLab's ColorFlex 45/0, D25A, and LabScan XE (as well as the tomato score formulas optimized for each instrument by HunterLab) as suitable for the evaluation of color to be used in grading processed tomato products. With these instruments, HunterLab provides a tomato tile standard calibrated based on UCD's tomato paste standards.

Conditions for Measurement

Instrumental: ColorFlex 45/0 with EasyMatch QC (EZMQC-Tomato/CFLX option), ColorFlex Tomato, D25A DP-9000 (D25-TPC/2003 option), LabScan XE with EasyMatch QC (EZMQC-Tomato/LSXE option).

Illuminant: C

Standard Observer Function: 2 degree

Transmittance and/or Reflectance: Reflectance only.

Formulas

ColorFlex 45/0

$$\text{Fresh Tomato Color Index (FTCI)} = 100\left(\frac{21.6}{L} - \frac{7.5b}{La}\right)$$

Tomato Juice Score = 25.963 + 0.989a - 1.787b

Tomato Paste/Puree Score = -81.582 + 1.069a + 15.390b - 0.591b^2

Tomato Sauce Score = -153.100 + 1.187a + 22.332b - 0.864b^2

Tomato Catsup Score = -80.888 + 8.355a - 0.144a^2 - 1.194b

Tomato a/b ratio = a/b

where

L, a, and b are Hunter L, a, b values.

D25 with DP-9000

$$\text{Fresh Tomato Color Index} = \text{FTCI} = 100\left(\frac{21.6}{L} - \frac{7.5b}{La}\right)$$

Tomato Juice Score = TJS = 25.715 + 0.956a - 1.748b

Tomato Paste/Puree Score = TPS = -58.296 + 1.093a + 12.120b - 0.480b^2

Tomato Sauce Score = TSS = -180.263 + 1.145a + 26.413b - 1.012b^2

Tomato Catsup Score = TCS = -99.999 + 9.532a - 0.166a^2 - 0.936b

Tomato a/b Ratio = a/b = a/b

where

L, a, and b are Hunter L, a, b values.

LabScan XE

$$\text{Fresh Tomato Color Index (FTCI)} = 100\left(\frac{21.6}{L} - \frac{7.5b}{La}\right)$$

Tomato Juice Score = 25.114 + 0.939a - 1.638b

Tomato Paste/Puree Score = $-40.926 + 1.061a + 9.473b - 0.376b^2$

Tomato Sauce Score = $-149.176 + 1.139a + 21.608b - 0.826b^2$

Tomato Catsup Score = $-81.964 + 8.321a - 0.142a^2 - 1.129b$

Tomato a/b ratio = a/b

where

L, a, and b are Hunter L, a, b values.

Typical Applications

Tomato processing.

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