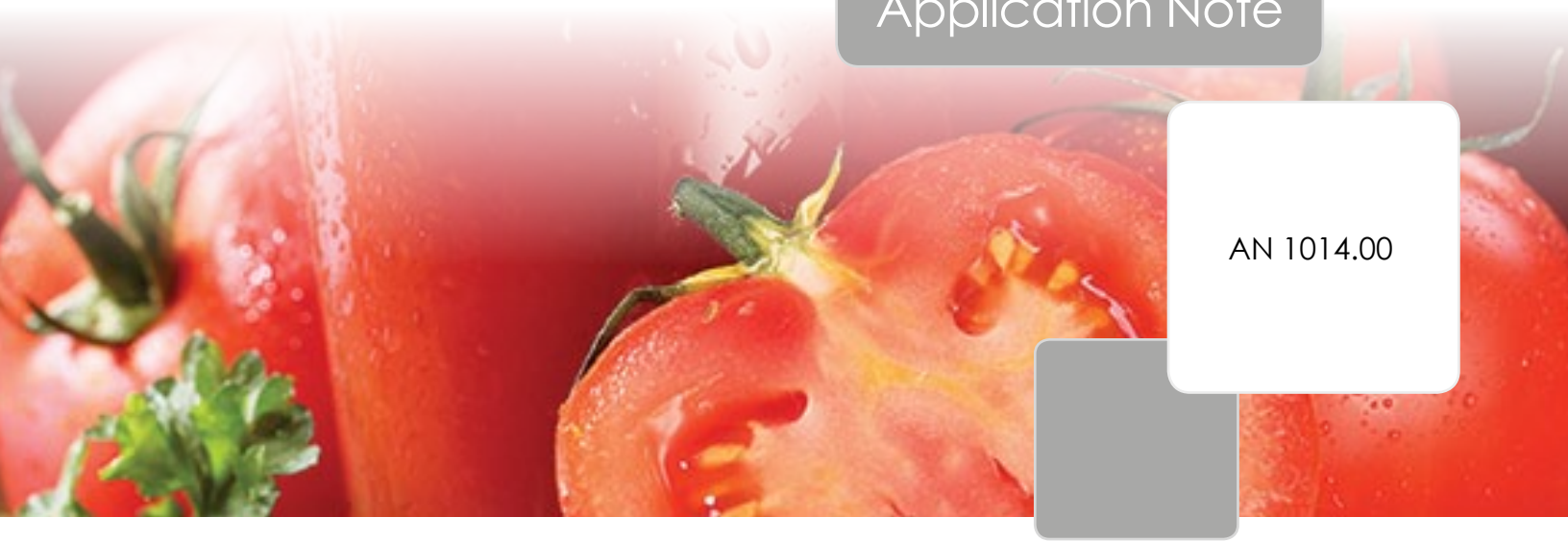
Application Note



AN 1014.00

Tomato Scores

"The redder the tomato, the higher the grade."

ABSTRACT

Color is an indication of quality and freshness of tomato products. As tomatoes are processed, their value is graded based on color. This application note looks at the colorimetric methods for evaluating tomatoes.

The world's true measure of color

HunterLab

CHALLENGE: To grade tomato products objectively.

Objective colorimetric methods for tomato products are based on methods and standards prepared by the University of California at Davis (UCD). Variables are minimized and each processor prepares their standards in a specified manner as defined by UCD. Using a tomato tile, the processor then assigns values based on a hitch standard. After that they can use the tomato tile to standardize their instrument for taking measurements that correlate to the tomato paste standards.

To simplify this process HunterLab provides a tomato tile standard calibrated based on UCD's tomato paste standards and USDA-approved formulas optimized for grading processed tomato products.

MATERIALS

- *Tomato Tile Standard*
- *Glass Sample Cup*
- *HunterLab Instrument (ColorFlex EZ, LabScan XE)*
- *Special Port Plate for Glass Sample Cup*
- *Opaque Light Shield*

The samples are prepared as prescribed by UCD and placed in special glass sample cups. Note that sample cups are to be purchased from the same supplier so that the calibration values will not be significantly different among the cups. 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.

Instrument	**Product**	**Index (Based on Hunter L, a, b values measured 2-degree/ Illuminant C)**
ColorFlex EZ w/EasyMatch QC or ColorFlex EZ Tomato	Tomato Juice	25.963 + 0.989a - 1.787b
	Tomato Paste/Puree	- 81.582 + 1.069a + 15.390b - 0.591b2
	Tomato Sauce	- 153.100 + 1.187a + 22.332b - 0.864b2
	Tomato Catsup	- 80.888 + 8.355a - 0.144a2 - 1.194b
	Fresh Tomato	100 ((21.6/L) – (7.5b/La))
LabScan XE w/EasyMatch QC	Tomato Juice	25.114 + 0.939a - 1.638b
	Tomato Paste/ Puree	- 40.926 + 1.061a + 9.473b - 0.376b2
	Tomato Sauce	- 149.176 + 1.139a + 21.608b - 0.826b2
	Tomato Catsup	- 81.964 + 8.321a - 0.142a2 - 1.129b
	Fresh Tomato	100 ((21.6/L) – (7.5b/La))

TOMATO TILE STANDARDS

There are two tomato tile standards in general use, one is the European (BCR No. 400) tomato tile and other is the American tomato tile available from HunterLab. The purpose of both tomato tiles is to check long-term instrument repeatability and improve inter-instrument agreement of processed tomato products (paste, puree, sauce, catsup and juice) in tomato color space.

BCR NO. 400 TOMATO PASTE COLOUR TILE

This tile is designed to match the color of plum tomatoes and is manufactured by Ceram Research UK. In response to requests from the European Community, CERAM Research supplied the clay-based „tomato red" tile standards to the Community Bureau of Reference (BCR). BCR is now the IRMM - Institute of Reference Materials and Measurements, the research center of the Commission of the European Communities, a primary standards body and they are the source for these tiles. This „European Tomato Red Tile" can be ordered as BCR (Community Bureau of Reference) Tomato Paste Reference Tile RM No. 400 with assigned Hunter L, a, b values. The nominal Hunter values of the tiles are: L = 26 ± 0.2, a = 33 ± 0.3 and b = 14.5 ± 0.1. Each tile is individually certified and intended for calibration purpose only.

AMERICAN TOMATO TILE

This tile is supplied with United States Department of Agriculture (USDA) traceable calibration. It is used for hitching the instrument to the USDA soft processed tomato standard.

METHOD TO ESTABLISH A HITCH STANDARD FOR THE TOMATO PASTE COLOR TILE IS AS FOLLOWS:

1. *Change the normal 32 mm diameter port to the sample cup port (04-6622-00 Port Insert for 2.5 in (64 mm) Sample Cup).*
2. *Standardize the Instrument using the supplied Black Glass and Calibrated White Tile.*
3. *Select a setup that is not in use. If using a CLFX Tomato Meter, Setup #10 is usually free.*
4. *Change the setup parameters to the following: Set Up Name can be something appropriate like "Tomato Color". Standard: Hitch Display: Absolute Average: OFF (will take just 1 reading) Ill/Obs: C/2 Color Scale: Hunter L, a, b (plain, no stars)*
5. *Go down more steps until cursor is beside the L, a, b labels, and the command line at bottom of screen asks User to update Hitch Target values.*
6. *Measure the Tomato Red Tile. The values should be similar to the assigned values.*
7. *Adjust the read values until they match the Hunter L, a, b C/2 values assigned to Tomato Tile.*
8. *Return to the measurement mode and read the tomato tile as an OQ (Operation Qualification) step. It should now read very closely to the values assigned to the tile showing the effect of the hitch.*
9. *Fill the sample cup (04-7209-00 Glass Sample Cup 2.5 in (64 mm) diameter) with tomato product to near the top.*
10. *Read the processed tomato product, record the Hunter L, a, b C/2 values for the sample as hitched to the Tomato Tile.*

METHOD FOR THE GRADING OF TOMATO PRODUCTS

1. *Make sure the sample cup port (04-6622-00 Port Insert for 2.5 in (64 mm) Sample Cup) is in place.*
2. *Select the "USDA or BCA Tomato Color" Setup.*
3. *Standardize the ColorFlex using its own Black Glass and Calibrated White Tile.*
4. *Read the tomato tile as an OQ (Operation Qualification) step.*
5. *Place the tomato tile at the port and take a reading.*
6. *Make sure the instrument is reading within +/- 0.3 of the Hunter L, a, b values assigned to the tile. If the tile is not within those tolerances, re-set the Hitch.*
7. *Fill the sample cup (04-7209-00 Glass Sample Cup 2.5 in (64 mm) diameter) with tomato product.*
8. *Read the processed tomato product and record the Hunter L, a, b values for the sample as hitched to the selected Tomato Tile.*

SUMMARY

Consumers have developed strong associations through appearance, and base their pre-purchase judgments of taste and quality on the appearance of the package or the product. Appearance measurement techniques, are therefore important for predicting the acceptance of product quality and the valuation of products such as tomatoes.

More Information about Color Measurement on our HunterLab Blog

measuretruecolor.com

REFERENCES

BCR a.k.a. IRMM: Institute for Reference Materials and Measurements - Reference Materials Unit, Retieseweg 111B-2440 Geel, Belgium, Tel: +32 14 571 705, Web: http://www.irmm.jrc.be, Mail: jrc-irmm-rm-sales@cec.eu.int

ABOUT HUNTERLAB

HunterLab, the first name in color measurement, provides ruggedly dependable, consistently accurate, and cost effective color measurement solutions. With over 6 decades of experience in more than 65 countries, HunterLab applies leading edge technology to measure and communicate color simply and effectively. The company offers both diffuse/8° and a complete line of true 45°/0° optical geometry instruments in portable, bench-top and production in-line configurations. HunterLab, the world's true measure of color.

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