



Application Note

No. 1053.01

Color Measurement of Spices

***Averaging multiple readings
minimizes measurement variation
associated with non- uniform
samples. . .***

Abstract

Color is an indication of quality and freshness of spices, that is why maintaining color accuracy and consistency in spices is important for appeal and for responding to today's customer's needs. Therefore, special spectrophotometers with the right accessories and presentation techniques are essential to ensure uniformity and more repeatable results during measurement.

HunterLab in the past developed ColorFlex EZ as one of the standard instruments to measure the reflectance of spices. However, as spectrophotometric technology has advanced in recent years, and as our customers' needs changes over time, HunterLab developed new innovative spectrophotometers that requires less sample prep and are designed specifically to move the sample under the sensor without touching the sample surface. This increases the measurement area of the sample.

Challenge: To measure spices with uniformity and repeatability

The instruments used in this test were Aeros, Agera, and ColorFlex EZ.

While the ColorFlex EZ uses a flash Xenon lighting source, Aeros and Agera use LED technology. A more significant difference is the size of the area of the sample that is measured. A summary of the port size and total area is listed below. The total measured area of Aeros is larger due to the rotation of the sample.

The instruments used in this test were Aeros, Agera, ColorFlex EZ.

1. While the ColorFlex EZ uses flash Xenon lighting source, Aeros and Agera use LED technology. Poor 50g of your sample in a 90mm Plastic Petri Dish (L02-1016-781) and tap your sample Petri Dish once on a hard surface to settle the loose spice and add a little of the spice until the dish is filled.
2. Scrap the surface of your sample to present a flat uniform surface. Put the petri dish with spice in the petri dish sample holder.
3. Take a single-color reading of the sample in all sensors. Make sure that the bottom of your Petri Dish is clean
4. Dump the sample in a different cup and refill it with a new batch of the same sample.
5. Repeat the measurement 2 times discarding the previous batch and using a different batch of spice each time. You have now three readings of the same sample.
6. Average the three-color readings for a single-color measurement representing the color of the batch. Averaging multiple readings minimizes measurement variation associated with non- uniform samples.
7. Record the average color values for the sample batch. A summary of the port size and total area is listed below. The total measured area of Aeros is larger due to the rotation of the sample.

Instrument	Port Size	Illumination	Measured Area
ColorFlex EZ	1 inch/25 mm	Flash XE	0.8 in²
Agera	2 inch/ 50 mm	LED	3.1 in²
Aeros	N/A	LED	7.8 in²/ 5100 mm²








Sample Preparation:

1. Poor 50g of your sample in a 90 mm Plastic Petri Dish. (L02-1016-781) and tap your sample Petri Dish once on a hard surface to settle the loose spice and add a little of the spice until the dish is filled.
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7. Record the average color values for the sample batch.



Results:

The absolute values and Standard deviation of each sample are shown in the table below.

	ColorFlex EZ			AGERA			AEROS		
	L*	a*	b*	L*	a*	b*	L*	a*	b*
Sample 1 	86.70	-0.49	24.13	86.79	-0.51	24.30	90.27	-0.80	25.21
	0.29	0.07	0.74	0.29	0.06	0.65	0.19	0.06	0.59
Sample 2 	81.93	-1.08	17.19	81.95	-1.36	17.46	84.62	-1.12	17.88
	0.28	0.03	0.26	0.25	0.03	0.23	0.31	0.02	0.08
Sample 3 	74.55	9.28	29.64	74.55	9.14	29.64	77.84	9.77	30.68
	0.52	0.15	0.20	0.32	0.13	0.21	0.09	0.06	0.07
Sample 4 	46.80	13.33	23.90	46.70	13.22	23.93	49.91	13.46	24.85
	0.58	0.03	0.10	0.60	0.01	0.08	0.09	0.04	0.07
Sample 5 	60.07	37.22	52.24	59.94	36.85	52.36	64.20	37.43	54.19
	0.16	0.32	0.33	0.07	0.20	0.21	0.23	0.13	0.27
Sample 6 	67.37	6.84	41.72	67.40	6.46	41.87	69.76	7.33	42.98
	0.05	0.05	0.43	0.01	0.05	0.47	0.16	0.04	0.09
Sample 7 	69.10	35.26	54.08	68.92	34.92	53.94	73.23	35.19	55.75
	0.04	0.13	0.20	0.06	0.11	0.15	0.04	0.08	0.12

Summary:

While all instruments can measure the spices with precision, the larger area of measure with the Aeros on non-homogeneous samples helps reduce the standard deviation of measurements (i.e. more repeatable) without requiring additional amount of sample material.

About HunterLab

HunterLab is the technology leader in color measurement solutions, providing instruments, software, knowledge and service to a wide variety of industries. With over 5 decades of experience in more than 65 countries, HunterLab applies our leading edge technology to your products helping you measure and communicate color simply and effectively.

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