Sensegood spectrophotometer for color measurement in grains

Photo: Sensegood spectrophotometer to measure color quality in grains – wheat, maize (corn), rice, barley, millet, quinoa, chia, sorghum, linseed, amaranth, bulgur (triticum), rye, to name a few.

Grains are cultivated in wide variety of geographic regions across the world. Grains are the major part of worldwide staple food.

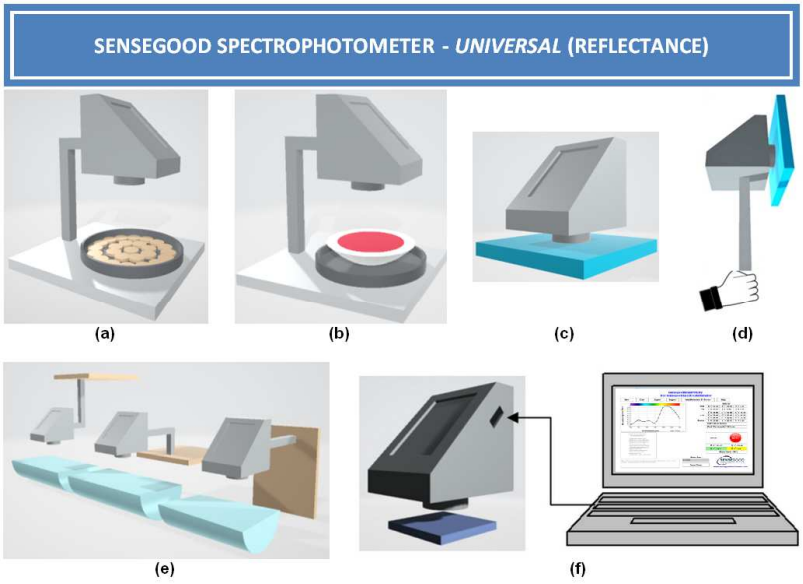
Importance of color in grains:
Color is the most important property in sorting and grading. The analysis and classification of seeds are essential processes for the final step of crop production. Apart from this, there are other aspects as well that make color measurement an essential need in grains.

Same crop that is grown in different regions exhibits different characteristics due to their varied weather conditions. Researchers from University of Arkansas analyzed the differences in kernel physical (color: whiteness, yellowness – *L*a*b**) and chemical (starch) properties in rice varieties from US, India, Italy, Taiwan, Mexico, Bangladesh, Bhutan, and China. [1] There is a direct relation between grain color and nutrition value.

Same variety crop grown in the same region also differs in its color characteristics depending on harvesting time. [2] Research published in Elsevier, Wiley and American Association of Cereal Chemists mention the effects of processing conditions like steaming, socking and milling in rice on color changes.[3]-[5] Color of grain indicates its biochemical properties. Different colored grains in different varieties when undergo same process, does not give uniform and favorable results.

Consumer's perception of the flavor of a cereal is closely related to its color. Hence it becomes an important aspect for any grain processor or cereal manufacturer to measure color of the grain and its products at all production stages. Color and texture of the final cereal or granola largely depends on the color quality of the input grains, ingredients and process parameters.

Instrumental color measurement:
In the process of visual color match; there are factors like eye fatigue, aging of the eye, stress, individual's different expressive perception toward color, and light source that affect the color match decision. Hence, it becomes difficult to make decision of accepting, reprocessing or rejecting the sample based on visual match. And this directly hampers the quality of the final product. While on other hand there are advantages of instrumental color quality control as it provides results with same accuracy, consistency and reliability.



- ✓ Benchtop/ Tabletop: (a) (b) (Rotating sample platform)
- ✓ Handheld/ Portable: (c) (d)
- ✓ Online/ In-process: (e)

- ✓ Solid: (a) (c) (d) (e)
- ✓ Liquid: (b) (e)
- ✓ Paste: (b) (e)
- ✓ Powder: (a) (b) (e)

- ✓ Contact measurement: (c) (d)
- ✓ Non-contact measurement: (a) (b) (e) (Adjustable height)

Works with:
- ✓ 5V adapter (cell phone charger)
- ✓ Power bank
- ✓ Computer/ Laptop (f)

- ✓ Averaging
- ✓ Auto repeat measurement mode
- ✓ Color match percentage
- ✓ Color indices (whiteness, yellowness, …)

- ✓ *SensegoodSmart* – computer interface software utility

Sensegood spectrophotometer for color measurement in grains:

Sensegood spectrophotometer is an analytical color measurement instrument that is widely accepted in the industry and research fraternity. From raw material to final product, it comprehensively evaluates the color attributes of various samples, including solids, liquids, powders and pastes. Sample can be non homogeneous with different shape and size. Sensegood spectrophotometer has rotating sample platform with large viewing area (sensor's field of view). It takes multiple measurements over number of rotations and generates average result representing the sample's color. As a result, consistency can be maintained and quality standards can be met with less waste, time, and effort.

Sensegood spectrophotometer helps in picking up even the slightest color difference over the production batches. It helps in finding difference between two colors and shows result in percentage match.

Reference:	Sample:
L*=+50.33, a*=+13.53, b*=+40.48	L*=+61.22, a*=+5.87, b*=+47.96

ΔL*=+10.89, Δa*=-7.66, Δb*=+7.48, ΔE*=15.27
Sample is Brighter, Greener (less Redder) and Yellower than reference.
Alarm limit = 92%, **MATCH:** 85%
Alarm triggered as Match % is below user set threshold of 92%

Sensegood Spectrophotometer for color measurement in maize

Photo: Sensegood spectrophotometer measures color difference in grains and displays result in percentage match. If matching is below user set threshold, it warns by providing alarm and indication on LCD. Reference can be saved and recalled anytime to compare it with sample. In photo: color difference measurement in maize (corn).

Sample (right) is Duller and Bluer (less Yellower) than reference (left).
ΔE*=10.63, Alarm limit = 95%, **MATCH: 89%**
Alarm triggered as Match % is below user set threshold of 95%

Sample (right) is Brighter, Redder and Yellower than reference (left).
ΔE*=16.76, Alarm limit = 90%, **MATCH: 83%**
Alarm triggered as Match % is below user set threshold of 90%

Sensegood spectrophotometer for color measurement and quality - consistency control in cereals and granola bars

Photo: Color has direct impact on "perceived" taste. Sensegood spectrophotometer provides information regarding color component differences in between sample and reference. This information assists in quick process parameter controls and reprocessing for color adjustments. Setting and ensuring color tolerances dramatically enhances color quality control.
In photo: Color measurement and finding match percentage to ensure color consistency in corn flakes (left) and granola bars (right). Color mismatch in production batch samples of granola bars indicate inconsistent quality and proportion of ingredients, also process parameter variations. Result is inconsistent taste and appearance; and ultimately leads to customer dissatisfaction. To build and maintain a brand of repute; product's consistency is one of the most important parameter to be addressed.

Do more with Sensegood spectrophotometer:
Sensegood spectrophotometer also incorporates continuous auto measurement mode. In this mode, it wakes up at user selectable intervals, takes measurement, compares the sample color with the saved reference, displays percentage match, and alarms to the operator with beeping sound in case if the matching percentage is below preset threshold. It has provision for averaging option in normal mode as well as in auto repeat measurement mode.

Sensegood spectrophotometer is equipped with algorithm to find various indices like – whiteness index, yellowness index, to name a few. Measured CIE L*a*b* values indicate strength of color parameters like: bright or dull, red – green and yellow – blue respectively. Measured color is also represented as reflectance graph, peak wavelength and color temperature on color touch LCD. Sensegood spectrophotometer is non-messy non-contact type instrument which has benefit of measuring sample's color from a distance. Because of this, sensor's optical assembly remains scratch proof enabling long life in retaining calibration. Non-contact measurement avoids any sample contact and contamination on sensor measuring surface. Sensegood spectrophotometer is the versatile device that is engineered to work as handheld/portable, benchtop/table-top or in-process/online color measurement instrument.

SensegoodSmart utility:
Sensegood spectrophotometer provides computer interface software *SensegoodSmart* which lets you to convey numeric color data across all production plants that may be located at multiple places across the globe. Each production plant uses Sensegood spectrophotometer to compare color attributes of the product manufactured in their plant with the numerical color information received from central plant or management. This enables them to reproduce each product consistently across all the plants. This feature is highly desirable for wide spread industry with plants at various places. It also assists in color consistency in packaging material supply chain.

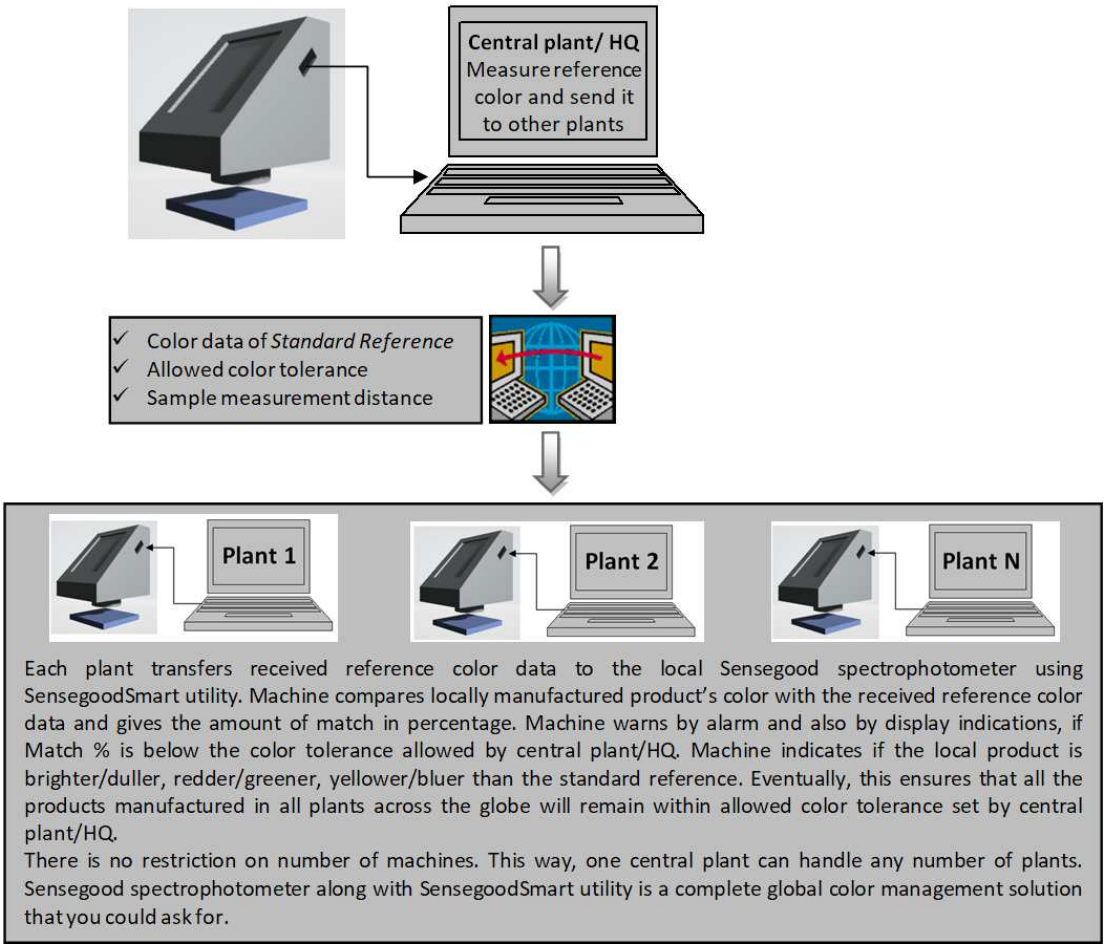


Photo: SensegoodSmart utility for color management across multiple production plants. Apart from this, SensegoodSmart utility enables user to store unlimited number of references to the computer. Any desired reference can be recalled and downloaded to Sensegood spectrophotometer whenever required. The utility provides all color related analytical information on single screen. This feature is even more desirable when using Sensegood spectrophotometer for in-process/online applications.

References:

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