Sensegood spectrophotometer for color measurement in pulses

Photo: Sensegood spectrophotometer to measure color quality in beans – gram, chickpeas, pigeon pea (tur or arhar), moong beans (green gram), urad (black matpe), masur (lentil), peas, kidney beans, moth, and other pulses.

Pulses are legumes which are mostly produced, and consumed as dry and green seeds in the world. Legumes are major sources of proteins and nutrients such as fiber, starch, vitamins and mineral elements.

Importance of color measurement in pulses:
Color is the most important property in sorting and grading. The analysis and classification of the seeds are essential processes for the final step of crop production. [1] Apart from this, there are other aspects as well that make color measurement essential need in pulses.

Sensory properties of the legumes, such as, aroma, flavor, texture, and color are significant. Indeed, according to preliminary studies, color is the most important parameter describing the quality of beans. This is in agreement with various large-scale consumer studies in which 40–60% of grade points, related to quality, were assigned to color. [2], [3]

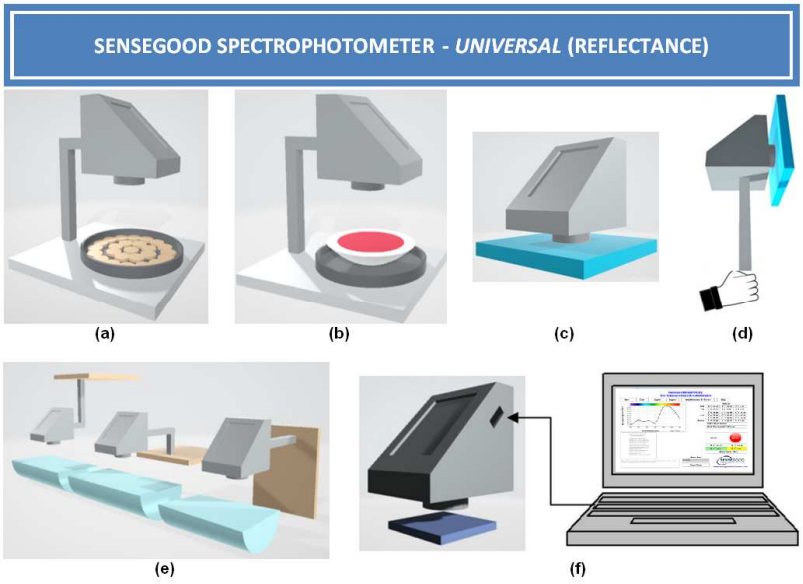
Color degradation can be due to storage at elevated temperature and humidity. [3] Color degradation of dried beans indicates deterioration of their quality, namely the water absorption capacity, texture of cooked beans, and flavor. [4], [5] More importantly it indicates the reduced protein quality. [6]

In today's competitive market, since consumers tend to use healthy and homogenous products, producers have to present products which are sorted according to physical characteristics like appearance, size, color, and variety. Furthermore, identification of varieties helps farmers to use suitable pulses for planting and marketing, because in this way the pulses they sell would have the essential standards for marketers.

Same crop that is grown in different regions exhibits different characteristics due to their varied weather conditions. There is a direct relation between pulses color and nutrition value.

Same variety crop grown in the same region also differs in its color characteristics depending on harvesting time. Color of pulses indicates their biochemical properties. Different colored pulses in different varieties when undergo same process, does not give uniform and favorable results.

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 quality and consistency control in pulses:
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*=+32.26, a*=+18.23, b*=+1.64	L*=+50.20, a*=+25.08, b*=+12.81

ΔL*=+17.94, Δa*=+6.85, Δb*=+11.17, ΔE*=22.22
Sample is Brighter and Yellower (less Bluer) than reference.
Alarm limit = 90%, **MATCH: 78%**
Alarm triggered as Match % is below user set threshold of 90%

Sensegood Spectrophotometer for color measurement in kidney beans

Photo: Sensegood spectrophotometer measures color difference in pulses 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 kidney beans.

Producers, warehouse managers, dried and packaged food (roasted beans) manufacturers and food processors rely on the capabilities of Sensegood spectrophotometer for determining quality and maintaining color consistency over different production batches. Using Sensegood spectrophotometer, pulses color analysis can be done by various indices like whiteness and yellowness index. Also L*, a*, b* color space values indicate light, redness/greenness and yellowness/blueness; useful in determining quality of white, yellow, green or brown textured pulses.

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.

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 plants and warehouses that may be located at multiple places across the globe. 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.

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INSTRUMENTS PVT LTD

www.sensegoodinstruments.com
Phone, WhatsApp, Signal, Telegram: +91 79 8484 8002
info@sensegoodinstruments.com

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