Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 23, Issue 1, 2023
PRINT ISSN 2284-7995, E-ISSN 2285-3952

DETERMINATION OF COLOR PROPERTIES OF SOME SEEDS

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Abstract

The aim of this research to determine of color properties of seed related to help in safe passage for seed through cleaning and separation processes. Also investigate some seed properties can be used in design and development of multi-seed planting machine. Soya bean, wheat, corn, cotton faba bean and sunflowers were tested at department of agriculture engineering, faculty of agriculture, Tanta University, Egypt. Through 2022. The design of feed mechanism system required easy movement for seeds this is a critically moving during the filling of the feed disk, so must detriments of the small differences in the surface area and topography of the grains and determine some image analyses. There are clear differences between faba bean and soybean in Hue value was 0. 626. the intensity, and the browning index was 91.75 and 16.25 in faba bean while in soybean were 0. 565,85.33, and 21.79 respectively. While the differences between corn and wheat in Hue value was 0. 699.Also the intensity, and the browning index was 100.08, 17.30 in corn while in wheat were 0. 708. 97.94, and 13.38 respectively. Also, clear differences between cotton and sunflowers in Hue value was 0. 634. Also the intensity, and the Black & White band was 87.40, and 87.40 in cotton while in sunflowers were 0. 480, 96.75 and 96.75 respectively.

Key words: *soya bean, wheat, corn, cotton, faba bean, sunflowers, color properties*

INTRODUCTION

Faba bean is the most important food legume crop and the most important cool season food and feed legume crop grown in many countries around the world. The crop is adaptable to a wide range of soil types and environmental conditions. More than 4.1 million households reported growing the crop on nearly 0.5 million hectares of land, yielding over one million tonnes of grain [3].
Soybean, Glycine max (L.), is gaining popularity in Sub-Saharan Africa and other parts of the world because of its economic potential for poverty alleviation and nutrition improvement. Despite its classification as an oilseed, soybean has a significant protein content. To accommodate the increased demand for human consumption (e.g., soy milk) and industrial products, (e.g., oil). Soybean production in developing nations is hampered by a lack of access to and availability of high-quality seeds [6].
One of the most frequently farmed cereal crops, maize (*Zea Mays* L.), is widely utilised for food, forages, and industrial raw materials. Variety purity, as an important component in maize seed quality evaluation, has a significant impact on final yield and farmer economic benefits [9]. Wheat is the world's most mechanized crop in world, thus particles and mechanical components are constantly in contact during wheat seeding, harvesting, grading, storage, and other processes [13].
Cotton is the world's most widely produced fiber and oil crop. The epidermis of the seed coat creates cotton fibres, and the embryo produces oils and proteins [14].
Sunflower is an important oil seed and food crop, and it produce 10% of oil in the world. Because of its superior quality and high stability, sunflower oil is primarily used in food applications [7] [5].For a phenotyping method to be suitable for large-scale crop research, it must be non-destructive and effective. Advanced tools, such as light detection and range (LiDAR) or hyperspectral cameras, can provide detailed information, but they are usually expensive and difficult to use for people with non-engineering backgrounds. On the other hand, red, green and blue (RGB) cameras have long been used in agricultural research. They are inexpensive and easy to use, and modern models can capture images with high spatial accuracy, as it allows many

complex image processing and analysis techniques to be able to extract and analyze different features from RGB images. A developed image analysis technology has also been used to determine the dimensions of the seeds using a flatbed scanner. for documentation through MATLAB program, which showed this technique a strong correlation between image analysis and experimental data for Egyptian maize and beans and the length and width of soybeans [2], [11].

There is predictability of end-season legume traits from the color and texture traits of seed images at the beginning of planting, where 140 color traits and 315 texture traits were derived based on the gray-level presence matrix from each image, and 5 techniques for fve regression classification. The best results were obtained by using the cube method as the regression method and using the random forest as the classification method. Yield (RMSE = 9.82, R2 = 0.68), maturity (RMSE = 3.70, R2 = 0.76) and seed size (RMSE = 1.63, R2 = 0.53) were identified as the possible early soybean traits. On the other hand, soybean, maize and wheat seeds scored the highest value for red (155.5, 144.9, 98), (156.4, 116, 41), (117, 89.2, 46.5) for red, green and blue, respectively [15], [8].

In the seeds of sunflower cultivars some traits such as color differed, illumination was chosen as a control factor. Four types of illumination were adopted for the studies: red (R = 255, G = 0, B = 0), green (R = 0, G = 255, B = 0), blue (R = 0, G = 0, B = 255) and white (R = 255, G = 255, B = 255). RGB metric values vary according to the equation used to define the metric,with some indicators having negative values, others positive, with sizes close to zero, and in some cases up to 2,348.3. The results showed that each channel had a maximum value that changes depending on the color of the seeds, for black. R = 182–189, G = 194–202, B = 211–218, and for white R = 112–118, G = 124–129, B = 133–139 [12], [1].

A digital image analysis (DIA) algorithm was developed to facilitate the classification of individual wheat grains using their compositional characteristics. Compositional features of individual nuclei are extracted from the different colors of the image to determine the color or gamut group that yields the highest classification accuracy in the grain. To reduce the computational time of the algorithm, the original grayscale values (250) were reduced to 32, 16, 8 or 4 grayscale values, the synthetic features extracted from each condition were used for classification and the results were compared. Compositional features extracted from green bars with a maximum gray level of 8 yielded the highest classification accuracy in grains. Using the best 15 features in the texture model, the classification accuracy for wheat was 85.2 and the classification accuracy for wheat was 87.0 [10]. The results show that stepwise regression models achieve quality predictions with coefficients of determination (R2) of 0.6949 for germination direction and 0.7148 for germination rate based on four distinct color parameters (R/(R + G + B), G/(R + G + B), (RG- B)/(R + G), and R/G), and the determination parameters passed the 0.01 test level [4]. The main objective of this research to determine of color properties of seed by image analyses. Also detriments of the small differences between (faba bean and soybean), (corn and wheat) and (cotton and sunflowers) by color indices.

MATERIALS AND METHODS

The experiment was carried out through 2022 at the Department of Agriculture Engineering, Faculty of Agriculture, Egypt, to verify the physical and optical properties of different seeds. These characteristics are used in the design and development of a metering device plate. Seeds dimensions were tested under a moisture level of 8 %. The current study was devoted to certain types of grains, which are Faba bean, Soybean, Corn, Wheat, Cotton, Sunflowers which were obtained from the Agricultural Research Centre. Samples were randomly selected and cleaned by hand as shown in

Measurements and determinations

- Optical properties

MATLAB software was used to measure the three additive primary colors of seeds, namely

(RGB). The 'R' value represents the red band, the 'G' value represents the green band, and the 'B' value represents the blue band. Also, Hue, the intensity was measured for all Varieties. Also, Black & White were used for cotton and sunflowers seeds, and a digital colorimeter was used to measure (L a b) for the browning index was calculated as:

-*Hue band*

$$H = \cos^{-1}\left\{\frac{\left(\frac{2R-G-B}{2}\right)}{((R-G)^2+(R-B)(G-B))^{0.5}}\right\} \quad \text{.....(1)}$$

-Intensity, candela= lumen per Ste radian

$$I = \frac{1}{3}(R+G+B) \quad \text{.....(2)}$$

$$I2 = (R-B)/2 \quad \text{..... .....(3)}$$

-Black & White

$$B\&W = \{(R+G+B)/3\} \quad \text{..... (4)}$$

$$X1 = (3R+2G+1B)/6 \quad \text{... .....(5)}$$

$$X2 = (2R+1G+3B)/6 \quad \text{..... (6)}$$

$$X3 = (1R+3G+2B)/6 \quad \text{..... (7)}$$

-Browning Index

$$BI = \frac{100*(X-0.31)}{0.17} \quad \text{.....(8)}$$

$$X = \frac{a+1.75L}{5.645L+a-0.3012b} \quad \text{.....(9)}$$

where:
RGB Red, Green, Blue Bands
L=lightness of the colour, which range from 0 (dark) to 100 (white).
a =indicates green colour.
-b =indicates blue colour
+b =indicates yellow colour.

RESULTS AND DISCUSSIONS

The optical properties of various grains (Faba bean, soybean, corn, wheat, cotton, and sunflowers) were measured and statistically analyzed. The relationship between seeds optical properties and colour indices, Black & White, and browning index is depicted in figures (1 through 6).

Faba bean

The results showed, the different colours bands for faba bean seeds. The R color band ranged from 113 to 171, in B color band ranged from 23 to 86, and in G color band ranged from 75to 153 while Hue was 0.167 to0 .836, and the intensity ranged from74 to 138.6. Browning index ranged from 2.37 to 30.63 as shown in Fig. 1.

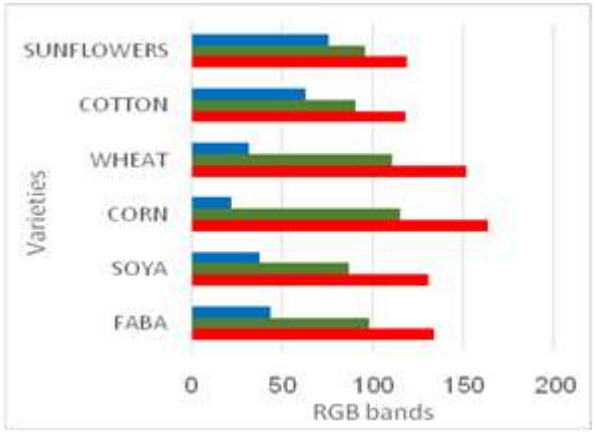

Fig. 1. The relationship between RGB bands and different varieties of seeds.
Source: Authors' determination.

Soyabean

The results showed, the different colors bands for soya bean seeds. The r color band ranged from 75 to 160, in b color band ranged from 18 to 65, and in g color band ranged from 55 to 111 while hue was 0.226 to 0.806, and the intensity ranged from 69 to 149.33. Browning index ranged from 4.48 to 60.28.as shown in Fig. 2.

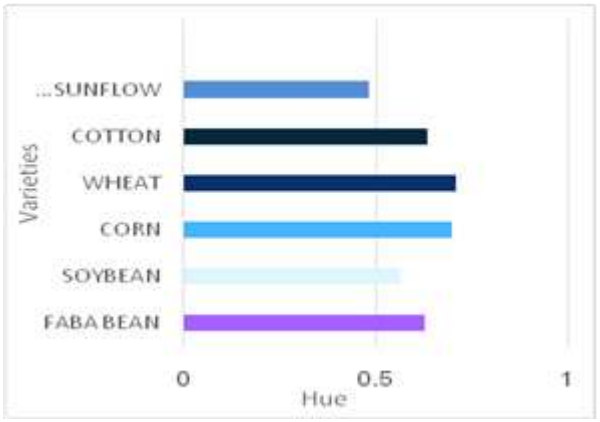

Fig. 2. The relationship between Hue and different varieties of seeds.
Source: Authors' determination.

Corn

The results showed, the different colors bands for corn seeds. The r color band ranged from 117 to 188, in b color band ranged from 4 to 121, and in g color band ranged from 78 to 158 while hue was 0.360 to 0.826,and the intensity ranged from 53.33 to 101.33.

Browning index ranged from 4.57 to 37.13.as shown in Fig. 3.

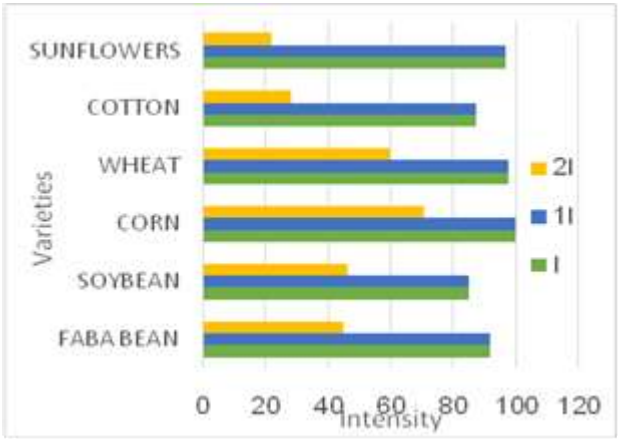

Fig. 3. The relationship between intensity and different varieties of seeds.
Source: Authors' determination.

Wheat

The results showed, the different colors bands for wheat seeds. The r color band ranged from 132 to 187, in b color band ranged from 12 to 83, and in g color band ranged from 85 to 150 while hue was 0.563 to 0.798, and the intensity ranged from 81.33 to 137.67. Browning index ranged from 3.17 to 31.91.as shown in Fig. 4.

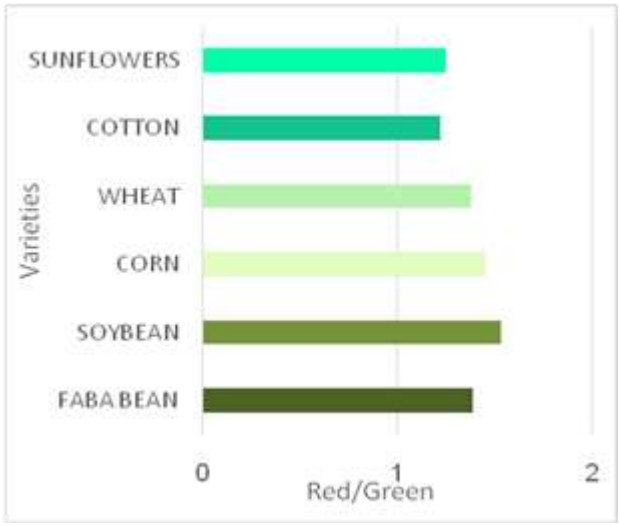

Fig. 4. The relationship between Red /Green band and different varieties of seeds.
Source: Authors' determination.

Cotton

The results showed, the different colors bands for cotton seeds. The R color band ranged from 82 to 103, in B color band ranged from 47 to 92, and in G color band ranged from 65 to 116 while Hue was 0.294 to 0.953,and the intensity ranged from 69.67 to 108.33. Black & White ranged from 69.67 to 108.33.as shown in Fig. 5.

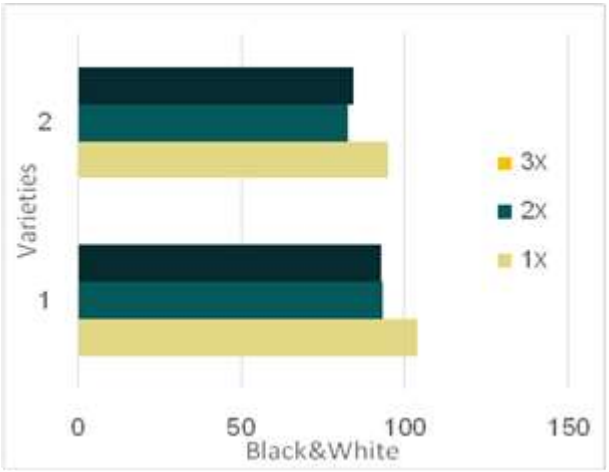

Fig. 5. The relationship between Black & White and cotton (1), sunflowers (2) seeds.
Source: Authors' determination.

Sunflower

The results showed, the different colors bands for sunflowers seeds. the Red color band ranged from 90 to 149, in B color band ranged from 55 to 97, and in G color band ranged from 75 to 134 while Hue was 0.146 to 0.847, and the intensity ranged from 76.67 to 126. Black & White ranged from 76.67 to 126.as shown in Fig. 6.

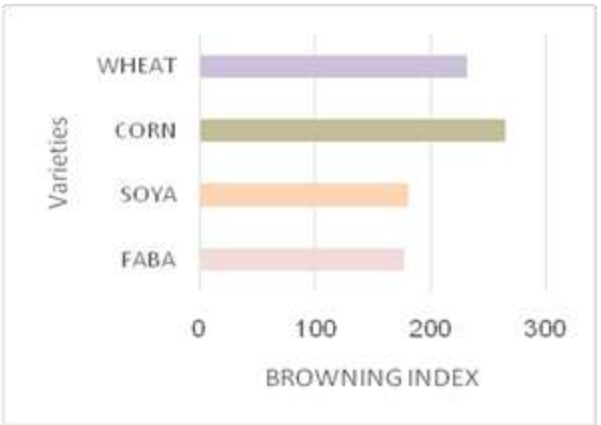

Fig 6. The relationship between Browning index and faba bean, soybean, corn, wheat seeds.
Source: Authors' determination

CONCLUSIONS

The results showed, the average of faba bean for the Red color band was 133.63, in Blue color band was 43.68, and in Green color

band was 97,94 while Hue was 0. 626.Also the intensity, and the browning index was 91.75, 16.25 respectively.

The results showed, the average of soybean for the Red color band was 130.73, in Blue color band was 37,94, and in Green color band was 87.31 while Hue was 0. 565.Also the intensity, and the browning index was 85.33, 21.79 respectively.

The results showed, the average of corn for the Red color band was 163.21, in Blue color band was 22, and in Green color band was 115.05 while Hue was0. 699.Also the intensity, and the browning index was 100.08, 17.30 respectively.

The results showed, the average of wheat for the Red color band was 151.42, in Blue color band was 31.36 and in Green color band was 110.78 while Hue was0. 708.Also the intensity, and the browning index was 97.94, 13.38 respectively.

The results showed, the average of cotton for the Red color band was 118, in Blue color band was 62.94 and in Green color band was 90.42 while Hue was 0. 634.Also the intensity, and the Black & White band was 87.40, 87.40 respectively.

The results showed, the average of sunflowers for the Red color band was 118.97, in Blue color band was 75.63 and in Green color band was 95.68 while Hue was 0. 480.Also the intensity, and the Black & White band was 96.75, 96.75 respectively.

In terms of optical properties, certain crops have no databases so we can't possibly construct, design, or develop equipment for various activities on these crops in modern ways.

In order to achieve the greatest accuracy and the least time to extract the color characteristics, it is recommended to use an assistant programming program such as Matlab and others from the Digital Image Analysis (DIA) algorithm for analysis of every pixel in the image.

ACKNOWLEDGEMENTS

The research was supported by Tanta Motors ABOU FREIKHA - Egypt company one from Egyptian agricultural equipment manufacturing companies. Deepest thanks to Eng. Alaa ABOU FREIKHA for his help, throughout my research work.

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