

## SPECTRAL PROFILING OF THE PULP OF AVACADO (*PERSEA AMERICANA*)

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### Abstract

The Avocado plant is scientifically known as *Persea americana*. It is a tropical evergreen tree that one of the most popular and nutritious fruits worldwide. With its lush green leaves and potential to bear fruits, this plant brings aesthetic appeal and a touch of practicality to your living space. The pulp was extracted from different solvent and the visible part of the spectra was analyzed by the UV Spectrophotometer. The Color profiling of the different extract was done through CIE diagram. This work presents relevant information on the application of avocado, with an emphasis on its CIE diagram, for nutritional and environmental purposes. The entire avocado is rich in bioactive compounds (pulp, peel and seed) and presents several health benefits, such as antimicrobial, antioxidant and anticancer activities, as well as dermatological uses and others. The purpose of this study was to provide a review of the literature regarding the traits, uses, and possibilities of Avocados (*Persea americana*). In addition to having high quantities of protein, potassium, and unsaturated fatty acids, avocados are thought to be one of the principal tropical fruits because they contain fat-soluble vitamins, which are uncommon in other fruits. Avocado pulp, which has a variable oil content, is utilized extensively in the cosmetics and pharmaceutical industries as well as in the manufacturing of commercial oils that resemble olive oil. The lipidic component of this fruit contains substances such squalene, phytosterols, tocopherols, and omega fatty acids, which are known to have health advantages.

**Keywords:** Avocado fruit, Spectral Profiling, CIE diagram and UV spectrophotometer activity.

### Introduction

The avocado trees are tall, going up to 30 feet. They have thick green leaves and sturdy trunks. These leaves are glossy and oval-shaped. These leaves radiate a vibrant shade of green. Moreover, avocado plants can adapt to various climates. It makes them popular in most countries. The plant's branches gracefully reach out in all directions, creating a beautiful canopy of foliage. They have a smooth, dark green or purplish skin that covers the creamy and delicious flesh inside. These

remarkable plants produce delicious and creamy avocados, known for their versatile uses in salads, guacamole and more. The avocado fruits grow in clusters, showcasing a unique pear-like shape with a bumpy, textured skin. (“Avocado Fruit - PotsandPans India,” n.d.)

Avocado plants are famous for their taste and have several benefits in various aspects. Here are some of the critical benefits of avocado plants: Avocados can help with weight loss despite having a high fat content. It consists of monounsaturated fats, which help increase satiety and reduce cravings. It leads to better appetite control. (Heskey, Oda, and Sabaté 2019)

Avocado consumption is associated with improved cardiovascular health. Avocados have healthy fats and potassium content. That helps lower bad cholesterol levels and reduce the risks of heart disease. (McCormack et al. 2010)

Avocado is a rich source of dietary (“Avocado Benefits for Skin: Uses,” 2013.) fiber, which helps in digestion. It also promotes a healthy gut by nourishing the growth of good gut bacteria.

Avocado cultivation contributes significantly to the agricultural sector in many countries. It provides income and employment opportunities for farmers and contributes to the economy.

Avocado plants contain persin, particularly the leaves, bark, and pits. It is mildly toxic to certain animals. Avocado toxicity is generally more concerning for dogs, cats and birds. In contrast, it's less of a concern for humans. In most cases, human consumption of ripe avocado fruit poses no significant health risks. (Blanco et al. 1994) However, people with a known allergy or sensitivity to avocados may experience adverse reactions. Thus, it's advisable to consult a health professional, if you want to add it to your diet.

## **Methodology**

### **Sample collection –**

Avocado fruit of the Hass variety was purchased from a local grocery store at Vijay Nagar Jabalpur. Sample was collected in a sterile polybag and brought to the lab for sample processing.

### **Sample processing –**

The peel and pulp extract of avocado were made. The peel was crushed using pestle mortar and 3 different solvents were chosen namely Methanol, ethanol and water peel was dissolved in

individual solvent and were filtered respectively. The pulp was also crushed in Pestle mortar and dissolved in 3 different solvents and filtered. (Dreher and Davenport 2013)

### **UV spectroscopy -**

All the extracts prepared in different solvents were analysed in UV spectrophotometer and absorption peaks was noted. (“(PDF) UV-Vis, FTIR and Antioxidant Study of Persea Americana (Avocado) Leaf and Fruit: A Comparison,” n.d.)

### **Image and Spectral Profiling**

In digital imaging, a pixel(or picture element) is the smallest item of information in an image. Pixels are arranged in a 2-dimensional grid, represented using squares. Each pixel is a sample of an original image, where more samples typically provide more-accurate representations of the original. (Mishra et al. 2021) Images are stored in the form of a matrix of numbers in a computer where these numbers are known as pixel values. These pixel values represent the intensity of each pixel. 0 represents black and 255 represents white.

A typical definition, such as in CSS, is that a "physical" pixel is 1/96 inch (0.26 mm). Doing so makes sure a given element will display as the same size no matter what screen resolution views it. In an image processing context, the histogram of an image normally refers to a histogram of the pixel intensity values. This histogram is a graph showing the number of pixels in an image at each different intensity value found in that image. For an 8-bit grayscale image there are 256 different possible intensities, and so the histogram will graphically display 256 numbers showing the distribution of pixels amongst those grayscale values. (Walsh et al. 2020) Histograms can also be taken of color images --- either individual histograms of red, green and blue channels can be taken, or a 3- D histogram can be produced, with the three axes representing the red, blue and green channels, and brightness at each point representing the pixel count. The exact output from the operation depends upon the implementation --- it may simply be a picture of the required histogram in a suitable image format, or it may be a data file of some sort representing the histogram statistics.

CIE - The chromaticity diagram represents the spectral colours and their mixtures based on the values of the primary colours(i.e Red, Green, Blue) contained by them. Chromaticity contains two parameters i.e, hue and saturation. When we put hue and saturation together then it is known as Chrominance.



**A-Peel ethanol(5ml)**

**B-Peel acetone(5ml)**

**C-Pulp acetone(5ml)**

**D-Peel water(5ml)**

**E-Pulp ethanol(5ml)**

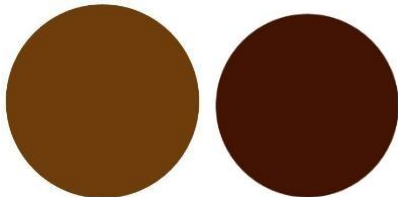
**F-Pulp water(5ml)**

**Sample A**

**(1) A central section of the color image was taken**

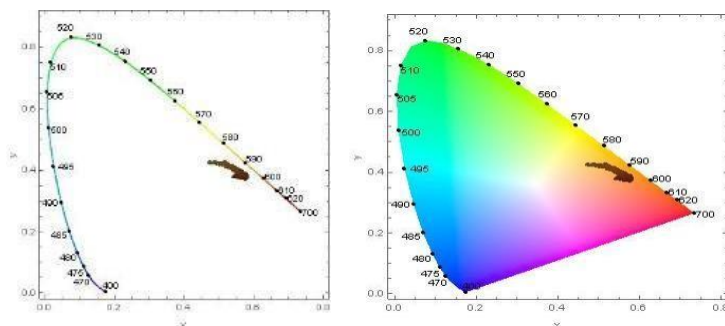


**(2) The HTML tonal variations of the color are given below:**



**Saddle Brown Maroon**

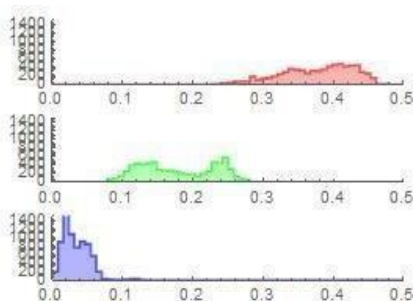
**(3) The CIE diagram shown below indicates the dominant color (chromaticity) about 590 nm**



**(4) The three RGB channels of the color image are shown below**



**(5) The histograms of the three RGB channels of the color image are shown below**

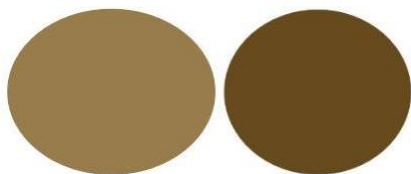


### Sample B

**(1) A central section of the color image was taken**

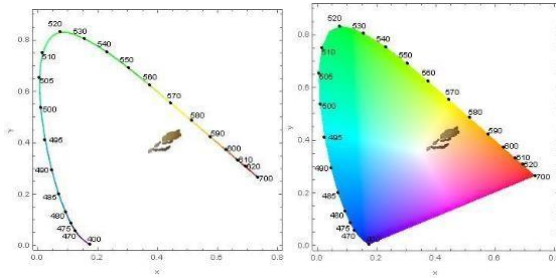


**(2) The HTML tonal variations of the color are given below:**

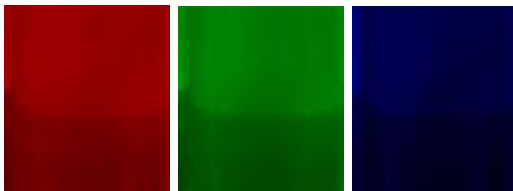


## Dark Golden Rod Saddle Brown

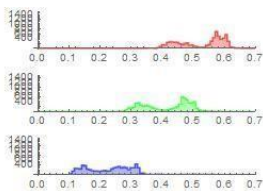
(3) The CIE diagram shown below indicates the dominant color (chromaticity) about 580 nm



(4) The three RGB channels of the color image are shown below



(5) The histograms of the three RGB channels of the color image are shown below

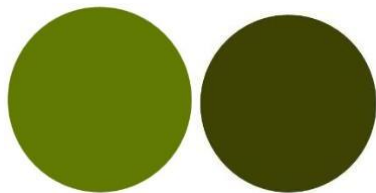


## (4)Sample C

(1) A central section of the color image was taken

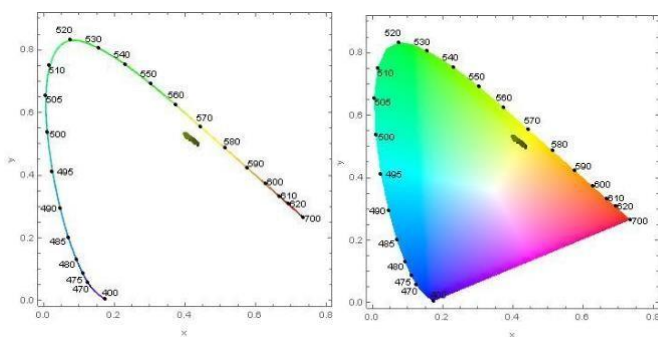


(2) The HTML tonal variations of the color are given below:

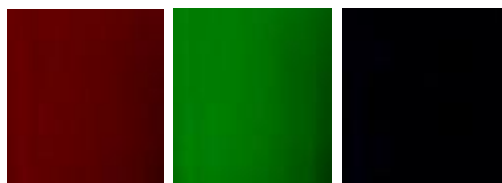


**Olive Drab Dark Olive Green**

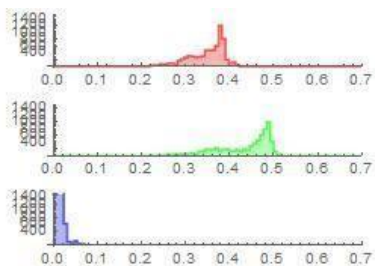
**(3) The CIE diagram shown below indicates the dominant color (chromaticity) as 570 nm**



**(4) The three RGB channels of the color image are shown below**



**(5) The histograms of the three RGB channels of the color image are shown below**

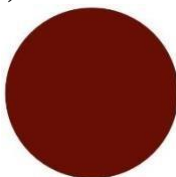


## **Sample D**

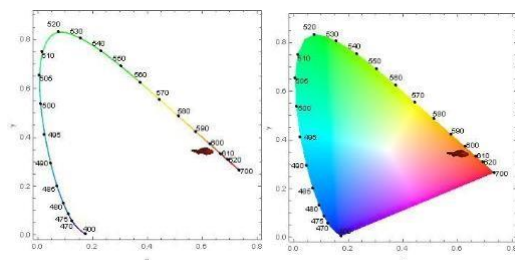
**(1) A central section of the color image was taken**



(2) The HTML tonal variations of the color are given below:



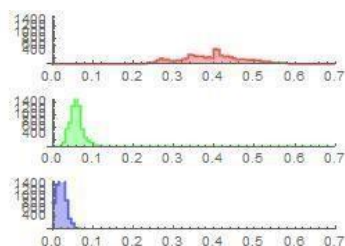
(3) The CIE diagram shown below indicates the dominant color (chromaticity) as 610 nm



(4) The three RGB channels of the color image are shown below



(5) The histograms of the three RGB channels of the color image are shown below



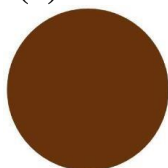


## Sample E

(1) A central section of the color image was taken

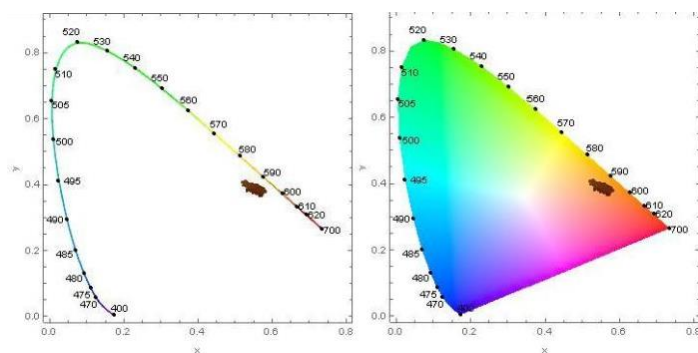


(2) The HTML tonal variations of the color are given below:



Saddle Brown

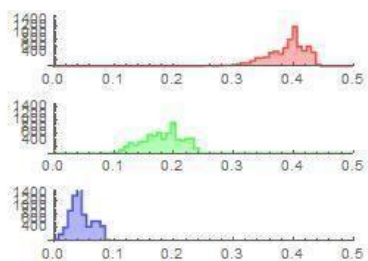
(3) The CIE diagram shown below indicates the dominant color (chromaticity) as 595 nm



(3) The three RGB channels of the color image are shown below



(4) The histograms of the three RGB channels of the color image are shown below



## Sample F

(1) A central section of the color image was taken

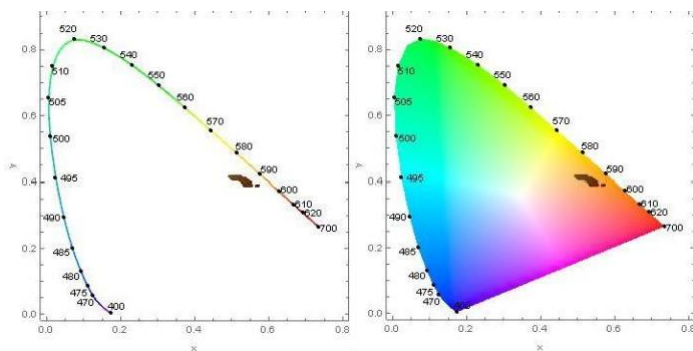


(2) The HTML tonal variations of the color are given below:

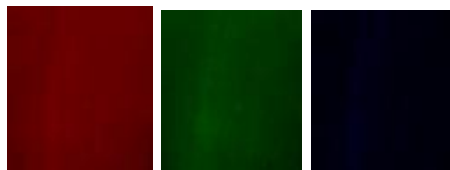


Saddle Brown

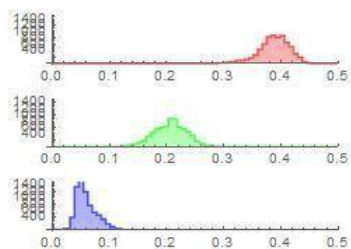
(3) The CIE diagram shown below indicates the dominant color (chromaticity) as 590 nm



(4) The three RGB channels of the color image are shown below



**(6) The histograms of the three RGB channels of the color image are shown below**



## Result & Discussion

Avocado peel and pulp extract were prepared and the spectral study by using UV double beam spectrometer was done. The absorption values were noted which were then used to prepare HTML tonal variations. The CIE diagram and RGB channels then histogram was prepared. The CIE diagram which basically tells the tonal color and tonal color tells us the nutritional value i.e. by just looking at the outer color nutritional content can be determined.

## Conclusion

The results demonstrate the potential of spectral and image analysis, demonstrating that the nutritious content of avocados may be ascertained solely by looking at their hue. Avocado pulp, which has a variable oil content, is utilized extensively in the cosmetics and pharmaceutical industries as well as in the manufacturing of commercial oils that resemble olive oil. The lipidic component of this fruit contains substances such as squalene, phytosterols, tocopherols, and omega fatty acids, which are known to have health advantages. The avocado was dissolved in three distinct solvents, and the color was observed. The CIE diagram was used to evaluate the color, which essentially indicates the tonal color, which indicates the nutritional value; that is, the nutritional content may be ascertained just by seeing the outer color. Research ought to keep identifying the profiles and phytochemicals that the commercial sector may use to maximize the nutritional and functional potential of avocado peels and seeds. The smooth texture, creamy taste and gorgeous green colour of avocados makes them a family favourite, whether it be the Hass variety with purple skin or the Shepard variety with green skin. When an avocado is ready to be eaten, put it in a plain brown paper bag and keep it at room temperature to

ripen. Usually, this takes between two and five days. Because apples and bananas release ethylene gas, a natural ripening agent, adding one of these fruits to the bag speeds up the process. Avocados can be kept from ripening by immersing them in water to inhibit the effects of ethylene.

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