- **Smartphone-Based Image Analysis for Rapid Evaluation of Kiwifruit Quality during Cold Storage**
  (Link: https://www.mdpi.com/2304-8158/11/14/2113)

Summary
In this paper, authors represented and analyzed 300 'Xuxiang' kiwifruit in order to observe the lifespan including rotting process in cold storage (2° C). Since kiwi is a citrus fruit, therefore, previously various methods including Vis-NIR , Sinclair IQ Firmness Tester (SIQ) and RGB image processing were used to detect the pH level, lifespan of kiwifruit, quality index and flavor compounds for extending the cold storage life. Here, authors used some tools, for insurance, temperature compensated refractometer NMR analyzer for identifying the weight loss, firmness, total soluble sugars, soluble solid as well as the shelf life. The main focus of this paper is how we can use smart phone image analysis using RGB recognition software for enhancing the shelf life of 'Xuxiang' kiwifruit in cold storage (2° C). Then RGB recognition will provide results following some parameters and central R/B and B/G of kiwifruit refers to the storage time. Thus, smartphones will be able to detect the freshness of kiwifruit.

Methodology
This paper used RGB recognition image processing for analyzing storage time, total plate counts, and some other factors including 1,3-Cyclooctadiene, ethylene with some other chemical ingredients. RGB images recognition analyzes the central R/B and B/G for detecting overall storage time. First of all, after taking pictures of different stages of 'Xuxiang' kiwifruit, then they carried out some chemical experiments for determining other factors like water distribution using NMR analyzer, Total plate counts (TPC), Total soluble sugars (TSS) which is measured by spectrophotometer through anthrone sulfuric acid colorimetric method. After collecting all required info, they observed the appearance of kiwifruit for 1 month in cold storage.

Components Used
The following components are used here:

1. Shenzhen Zhijie Imaging Camera
2. Colorpic App
3. Huawei P40, China (Smartphone)
4. Sartorius BSA224S electronic balance
5. Fruit firmness tester
6. SUPOR JR05-300 (Home type blender)
7. HIRP V1700G (Spectrophotometer)
8. Niumag Benchtop NMR Analyzer PQ001
9. Carr-Purcell-Meiboom-Gill
10. Chromatography–mass spectrometry (HS-SPME-GC/MS)
11. Solid-phase microextraction head (50/30 μm DVB/CAR/PDMS)

Findings

Here, they found some findings after analyzing various factors. of 'Xuxiang' kiwifruit and the ratio of R value, G value and B value using RGB image recognition using the Colorpic app from a smartphone. This image processing through a smartphone can detect the shell life of kiwifruit stored in cold storage (2° C).

Novelty

The innovative technology of this research work is using RGB image recognition technology through smartphones for predicting shelf life and quality parameters rather than using other instruments.

Analysis

Several analyses were held during this experiment including volatile flavor compounds, TSS, TPC, image processing using RGB recognition using Huawei smartphone, physical quality attributes like fruit fresh color, appearance, firmness of kiwifruit etc.

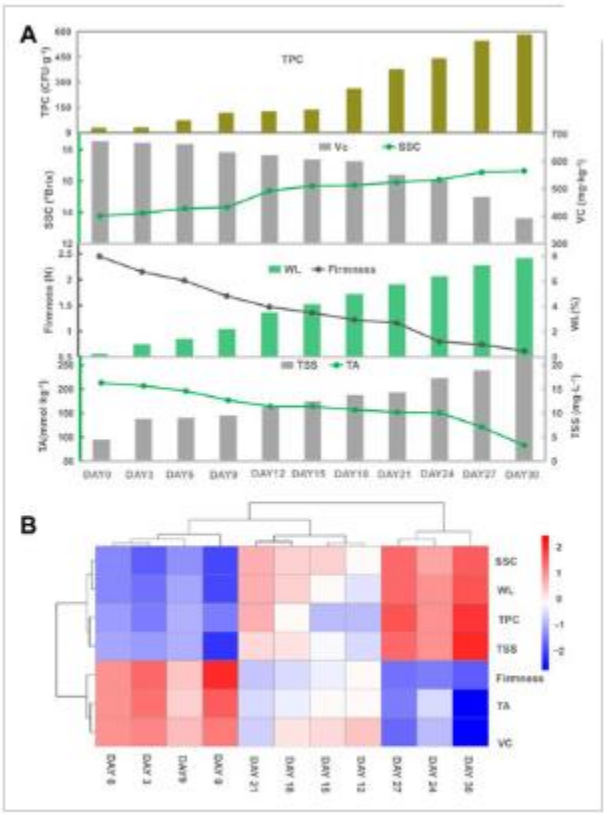

Figure 2. Firmness, weight loss (WL), titratable acidity (TA), total soluble sugars (TSS), total plate count (TPC), soluble solids content (SSC), vitamin C (VC) of 'Xuxiang' kiwifruit stored at 2 °C for 1 month (**A**). Heatmaps for quality indicators (**B**).

Research Gap

Here, every single quality analysis for better understanding of kiwifruit's lifespan including the storage time in cold places and more accuracy rate for predicting decay time of kiwifruit.

Problems Faced

While writing a summary of this research paper, the components used are not clearly defined in points. They wrote here within the material and methods segment.

Future Work

In future, instead of using RGB recognition methods in smartphones, the researchers can try to implement actual image processing through CNN and k-means clustering with Gaussian elimination for securing better identification of rotten kiwifruit.