



CHEMICAL DIVERSITY TOWARDS SUSTAINABLE DEVELOPMENT GOALS

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Development of a colorimeter based on ESP32 microcontroller coupled with a smartphone app for the quality control of roasted coffee beans

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A low-cost and portable colorimeter was developed based on ESP32 microcontroller and TCS34725 color sensor for monitoring the coffee roast levels. The device detected the color recognition resulted in RGB color intensity. The obtained color values could display on TFT LCD touch screen of the device and the colorimetric data also real-time sent via wifi to store in MySQL database using a smartphone app that was created with MIT App Inventor platform. A rechargeable lithium phosphate battery (3.7 V 2000 mAh) was employed as the power supply for the colorimeter. Consistency of coffee roasting was controlled by self-identified the standard RGB values of the roasted coffee beans at five levels (light, light-medium, medium, medium-dark, and dark) with the app. The darker color of roasted coffee, the lower RGB values were gained. The color detection was highly precise with a relative standard deviation less than 4.2 %. The colorimeter was also applied for on-site monitoring of the ripeness degree of the coffee cherry.

Keywords: colorimeter; ESP32 microcontroller; color sensor; smartphone app; coffee