Oral Session | Food Quality

[4-1015-D]Food Quality (1)

Chair:Yutaka Kitamura(University of Tsukuba, Japan), Mizuki Tsuta(National Agriculture and Food Research Organization)

Wed. Sep 4, 2019 10:15 AM - 12:00 PM Room D (4th room)

10:30 AM - 10:45 AM

[4-1015-D-02]Assessment of Red Tomato Freshness Using Ultraviolet-induced Fluorescence Image

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A tomato (*Solanum lycopersicum*) is harvested with a yellow, pink or red color, although it turns red when it reaches to a consumer. The red tomato is better in taste. Thus, the agriculture near an urban area make use of the red tomato at the harvest in some countries including Japan. However, the color of red tomato does not change. Thus, it is difficult to distinguish a degraded tomato from a fresh one. This is a limitation of a color for an indicator of tomato freshness. In contrast, ultraviolet (UV)-induced fluorescence provides another color information of tomatoes. In this study, we investigated a potential of tomato fluorescence to monitor the tomato freshness during the storage. Tomatoes (cultivar: Momotaro) were harvested on June 19th, 2018 at greenhouse in Ehime University with a red color. The total of 50 tomatoes were stored at 4 and 25° C for 8 d. A halogen lamp and UV light emitting diode (LED, 365 nm) were used for light sources of color and fluorescence images, respectively. A high-resolution CMOS camera EOS Kiss x7 (Canon Inc., Japan) with parameters set as ISO 100, F-6.3 and shutter exposure 1/25 s (for color images) and 4 s (for fluorescence image) was used. The color and fluorescence images were captured during the storage. The efficacies of these techniques were discussed in terms of the possible evaluation period and the sensitive color channel. In the color image, tomato color changed from a red to a deeper red, while in the fluorescence image the color changed from a blue to a blue-white gradually. At 4° C, the changes in both colors were relatively small compared with 25° C storage. To quantify the chromaticity, RGB values of each image was calculated and then expressed as its ratio (such as R/(R+G+B)) followed by the normalization using its initial mean value. In the color image, the R and G ratio changed rapidly within the initial 2 or 4 d, while in the fluorescence image, the G ratio changed up to 8 d. The reasons of these changes are also important for the application of this technique to the field. The origin of the color image was assigned to the lycopene synthesis, as shown in our extracts. In contrast, the excitation-emission matrix (EEM) of tomato pericarp suggested the origin of fluorescence images. EEM exhibited no fluorescence peak of lycopene in visible region. This was reasonable, since carotenoid is known to be week in the fluorescence. There also existed no peak of chlorophyll. This is also reasonable, since in the past studies, it is known that there are few chlorophylls in red tomatoes near the detection limit of high-performance liquid chromatography (HPLC). Hence, the possible origin of fluorescence image was some phenolics including flavonoid since phenolics are abundant in the tomato skin. Overall, the fluorescence image (the G ratio) was effective to monitor the tomato freshness for entire 8 d, while the color image (the R and G ratio) was effective only for the initial 2 or 4 d. As the most transportation and storage process happen in a cold chain with an ambient air, this study would help the development of monitoring system after the harvest before consumption.