Applications Note

Insight on Color **Vol. 17, No. 9**

Color Measurement of Lycopene in Tomato and Watermelon Products

Eighty-five to ninety percent of the color of a red, ripe tomato is due to the presence of lycopene. The skin of the tomato has the highest lycopene content of all its parts. Since tomato skins are discarded in large quantities during the processing of tomatoes into paste, sauce, ketchup, etc., lots of lycopene is being lost. The potential exists to use this skin waste as a source of lycopene as a red colorant, primarily for foods (though this is not currently allowed in the United States). Lycopene is also beginning to be marketed as a nutritional supplement, since it is an excellent antioxidant and can help prevent heart disease and some forms of cancer. Of course, raw tomatoes and, especially, processed tomatoes, are rich in this healthy lycopene.

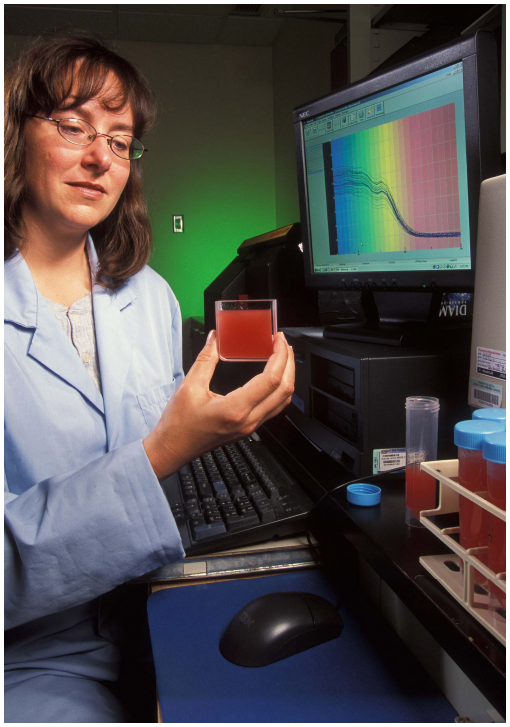
Watermelon also contains lycopene (as much as or more than raw tomato) and some efforts are underway to breed higher levels of lycopene into watermelon species for its nutritional benefits.

HunterLab already has a great deal of experience measuring processed tomato products (the ColorFlex, LabScan XE, and D25A are currently deemed suitable for measurement of tomato paste, sauce, catsup, and juice by the United States Department of Agriculture), so it is not surprising that the red color of lycopene can be measured using HunterLab instruments. In the F. J. Francis article listed in the References, lycopene puree was placed in a 10-mm transmission cell and measured in total transmittance mode (TTRAN) four times with replacement using an UltraScan XE. The UltraScan XE (as well as the ColorQuest XE, ColorQuest XT, UltraScan PRO, and UltraScan VIS) has several characteristics that make it more useful than an analytical spectrophotometer for measuring lycopene puree.

- The diffuse/8° geometry is appropriate for a highly scattering medium like watermelon or tomato puree. A 0°/0° standard analytical instrument would be adversely affected by this scattering.
- The pulsed xenon lamp can "punch" light through the translucent puree. The quartz halogen lamps of analytical spectrophotometers may not be able to this.

In the Davis articles, lycopene concentration was correlated to an absorbance value (the absorbance at 560 nm adjusted for scatter by subtracting absorbance at 700 nm). A colorimetric correlation based on Hunter a and b should work as well.

This method of analysis is quicker and easier than high-performance liquid chromatography and does not require use of hazardous solvents like acetone and hexane.



Angela Davis preparing to measure watermelon puree in a 10-mm transmission cell. Photo courtesy USDA Agricultural Research Service

References

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