A portable measuring device to detect optimum ripeness in tomatoes

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Josu Trebolazabala analyzes the composition of a tomato using a Raman spectrometer. Credit: Txetxu Berruezo

A portable Raman spectrometer, a device used in very different fields such as metallurgy, archaeology and art, allows data to be obtained on the variation in the composition of tomatoes during various ripening phases, according to the results of a study conducted in the UPV/EHU's Department of Analytical Chemistry. The portable Raman spectrometer

is an instrument widely used across a range of sectors. It is a non-invasive technique that can be used, for example, to detect the pigments in a painting without extracting any samples, thus preserving the integrity of the work. In this case, a research team of the UPV/EHU used a Raman spectrometer for culinary research. According to Josu Trebolazabala, the author of the study, "It is about transferring this technology, which had a specific use, to the kitchen. Our idea was to come up with a tool that could help producers find out when their tomatoes have reached their optimum ripeness point. This is achieved without destroying the fruit."

The results provided by the device are comparable to those provided by a similar laboratory instrument. "Even though the quality of the Raman spectra of the lab instrument was higher, the quality of the information provided by the portable instrument could be regarded as sufficient for this purpose. The aim is to enable producers to go to the vegetable plot with this equipment, place the Raman probe on the tomato, and find out whether it is at its optimum picking point or whether it needs to be left longer so that it can ripen properly," said Jose Trebolazabala.

Tomato ripening

Monitoring the composition of tomatoes during ripening phases has made it possible to observe the changes that take place in the composition of the tomato during its passage from an unripe state towards a ripe state. "When the tomato is green, the main pigments are chlorophyll (hence its green colour) and the waxy cuticles, which are on the outside," explained Trebolazabala. But the presence of these compounds drops as the fruit reaches its point of optimum ripeness. "Once the colour changes to orange, compounds of a different type are observed; the carotenoid compounds are activated. The tomato gradually acquires nutrients until it reaches its optimum point—in other words, when the lycopene (the red carotenoid) is at its maximum level. After

that, the tomato begins to lose its carotenoid content, as shown by the analyses conducted on overripe tomatoes."

This innovative technique can be extrapolated to any other food that changes colour during its ripening phase. "Tests have been carried out on peppers and pumpkins, for example, and it is also possible to obtain the data on their composition," he explained.

More information: Josu Trebolazabala et al, Portable Raman spectroscopy for an in-situ monitoring the ripening of tomato (Solanum lycopersicum) fruits, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy* (2017). DOI: 10.1016/j.saa.2017.03.024

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