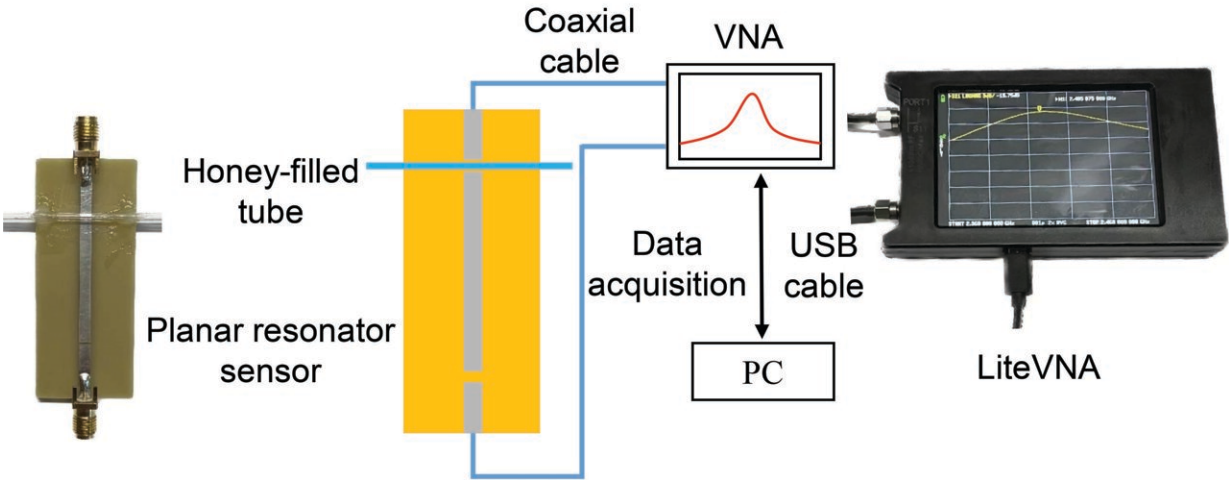


Sweet victory: Sensor detects adulteration in honey

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A diagram of the experimental setup including the planar resonator sensor. The liquid sample tube is placed in the gap as shown here. Credit: Qi Jin, Zhaozong Meng, Zhijun Chen, and Zhen Li

Adulteration is a bitter truth in the sweet world of honey. As consumers seek nature's nectar for its purity and health benefits, a shadowy industry taints this golden elixir with hidden additives, most commonly water.

Standard detection methods of [honey](#) adulteration are expensive, and either have complicated operation methods or low detection accuracy.

A team of scientists from the Nanjing University of Aeronautics and Astronautics and the Hebei University of Technology has developed a microwave microstrip line planar resonator sensor tool to detect water adulteration in honey. The tool is compact, cost-effective, and easily fabricated.

The article, "Evaluation of adulteration in honey using a microwave planar resonator sensor," appears in *Review of Scientific Instruments*.

The microstrip line resonator sensor is fabricated on a dielectric substrate, which is an insulator that can efficiently support electrostatic fields, such as ceramic or glass. On top there are three thin copper strips separated by two gaps. The length of the middle strip and the electric field intensity at the gaps determine the resonance frequency of the device.

"When we add water to honey, it changes how the [electromagnetic field](#) behaves around it," said author Zhen Li. "When placed in the sensor, adulterated honey shifts the sensor's resonance frequency. By measuring this shift, we can detect water adulteration in honey."



Jars of honey line the shelves at a grocery store. Credit: American Institute of Physics

The team tested honey samples with varying water content. They found that the sensor's resonance frequency consistently decreases with increased added water content.

"When choosing a honey product, my family members always have the concerns of whether it is authentic or not," said Li. "This sensor provides a cost-effective and efficient method for the [food industry](#) to ensure honey authenticity."

The device inspires further applications in liquid analysis, in industries such as food quality control, pharmaceuticals, and petrochemicals, for detecting impurities or composition changes, potentially advancing sensing technology.

"We aim to extend our research to detect adulteration in other liquid products and develop more sensitive sensors for broader applications in quality control and [food safety](#)," said Li, "starting with the impact of temperature on our sensor's performance."

With the dedication of scientists like those behind this efficient sensor, we can look forward to a future where the honey in our jars remains untainted and as pure as the bees intended.

More information: Qi Jin et al, Evaluation of adulteration in honey using a microwave planar resonator sensor, *Review of Scientific Instruments* (2023). [DOI: 10.1063/5.0166005](https://doi.org/10.1063/5.0166005)

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