Novel enzyme-free strategy to detect organophosphorus pesticide residues

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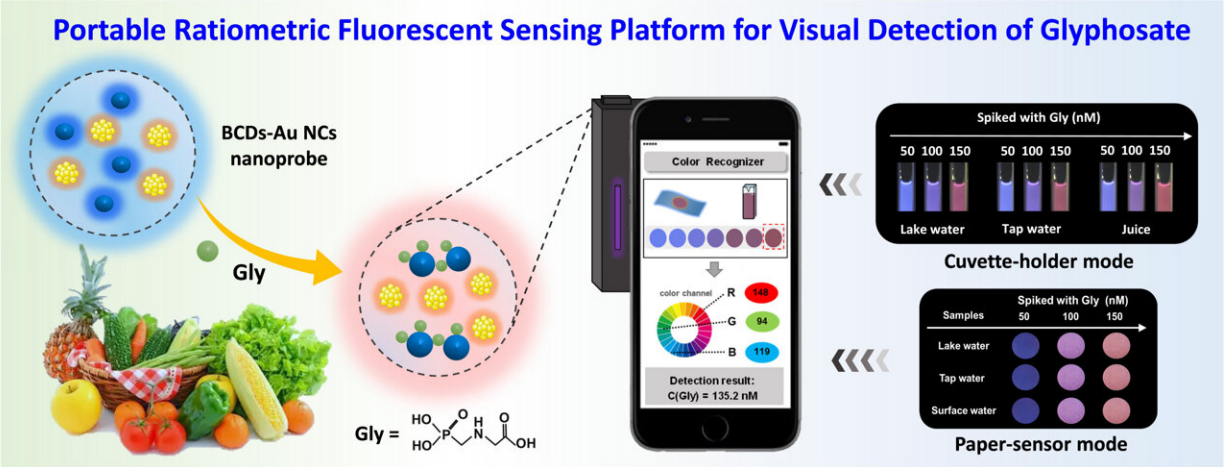

Figure 1. Schematic diagram of the rapid visualization and quantification of glyphosate residues by ratiometric fluorescence sensor. Credit: Zhang Qianru

High usage and unreasonable methods have caused excessive residues of glyphosate in agricultural products, so it's necessary to find rapid and highly selective methods for detecting glyphosate residues. Laboratory instrument–based methods or enzyme-inhibition methods usually have harsh environmental requirements and complex operational problems. Therefore, the establishment of a highly selective and sensitive strategy for rapid quantitative analysis of glyphosate residues is of great importance for trade, environment, food, and human health.

A novel and simple ratiometric fluorescence sensor was recently developed for selective and visual quantitative detection of glyphosate residues by a research team from the Hefei Institutes of Physical Science (HFIPS) of the Chinese Academy of Sciences. Results were published in the *Journal of Hazardous Materials.*

The team, led by Prof. Jiang Changlong, has been studying visual sensing platforms for the rapid quantitative detection of glyphosate in the environment and food for years.

In this work, they developed an enzyme-free portable sensing platform based on ratiometric fluorescent nanosensors for the rapid visual detection of glyphosate.

The sensor consists of as-prepared blue carbon dots (CDs) and gold nanoclusters. When glyphosate residues react with CDs, aggregation-induced quenching leads to rapid fluorescence quench of the CDs, while the orange fluorescence of the gold nanoclusters remains unchanged, according to Dr. Zhang Qianru, first author of the study.

Since the sensor is enzyme-independent, it achieves rapid visualization response and reading detection of glyphosate in a very short time (two seconds) through fluorescence chromaticity changes, with detection limits as low as 4.19 nM, far below the maximum contamination level.

In addition, the researchers combined 3D printing technology and a smartphone color recognizer APP to develop a portable fluorescent detection platform for rapid visualization and quantitative monitoring of glyphosate under real-time/field conditions, providing a new strategy for rapid on-site detection of pesticide residues.

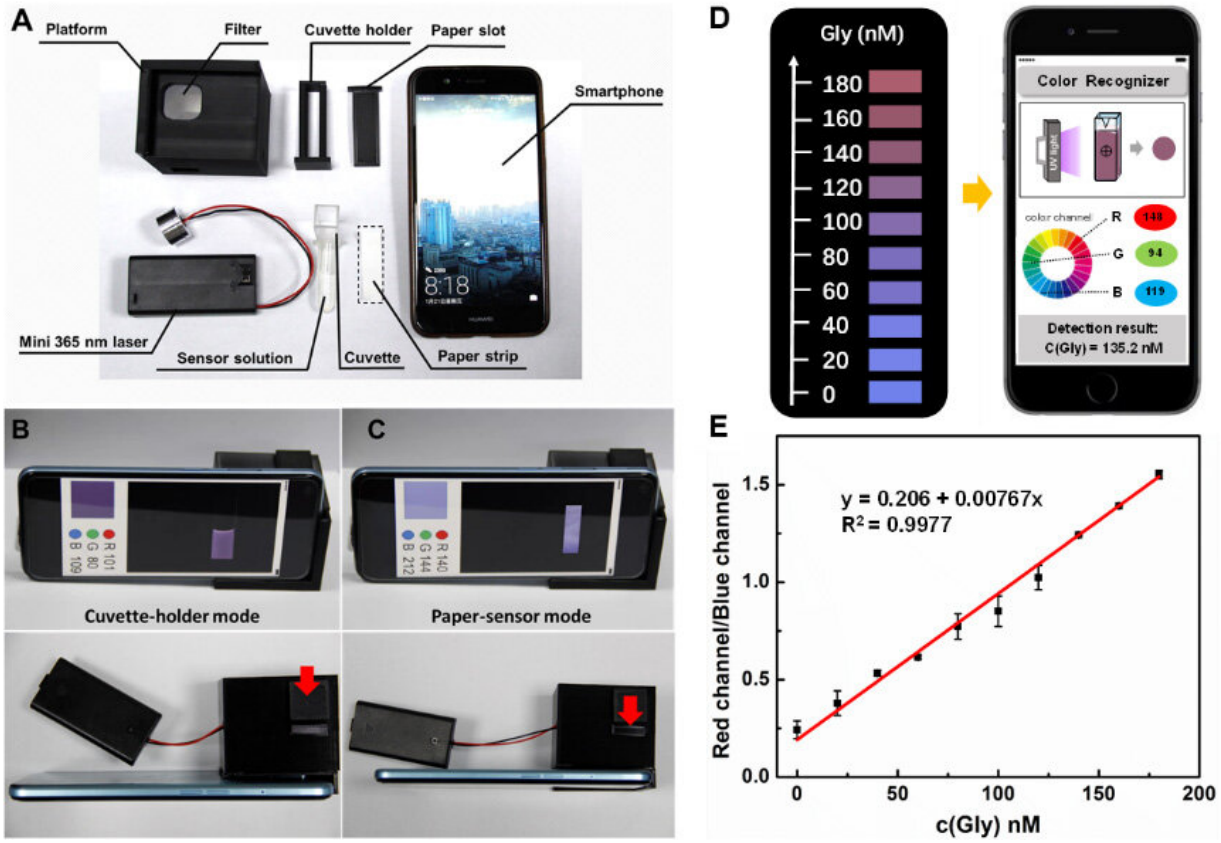

Figure 2. Smartphone-based monitoring platform for visual quantitative detection of glyphosate. Credit: Zhang Qianru

More information: Qianru Zhang et al, Enzyme-free and rapid visual quantitative detection for pesticide residues utilizing portable smartphone integrated paper sensor, *Journal of Hazardous Materials* (2022). DOI: 10.1016/j.jhazmat.2022.129320

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