

# DETECTION OF PLANT PATHOGENIC FUNGI BY A FLUORESCENT SENSOR ARRAY

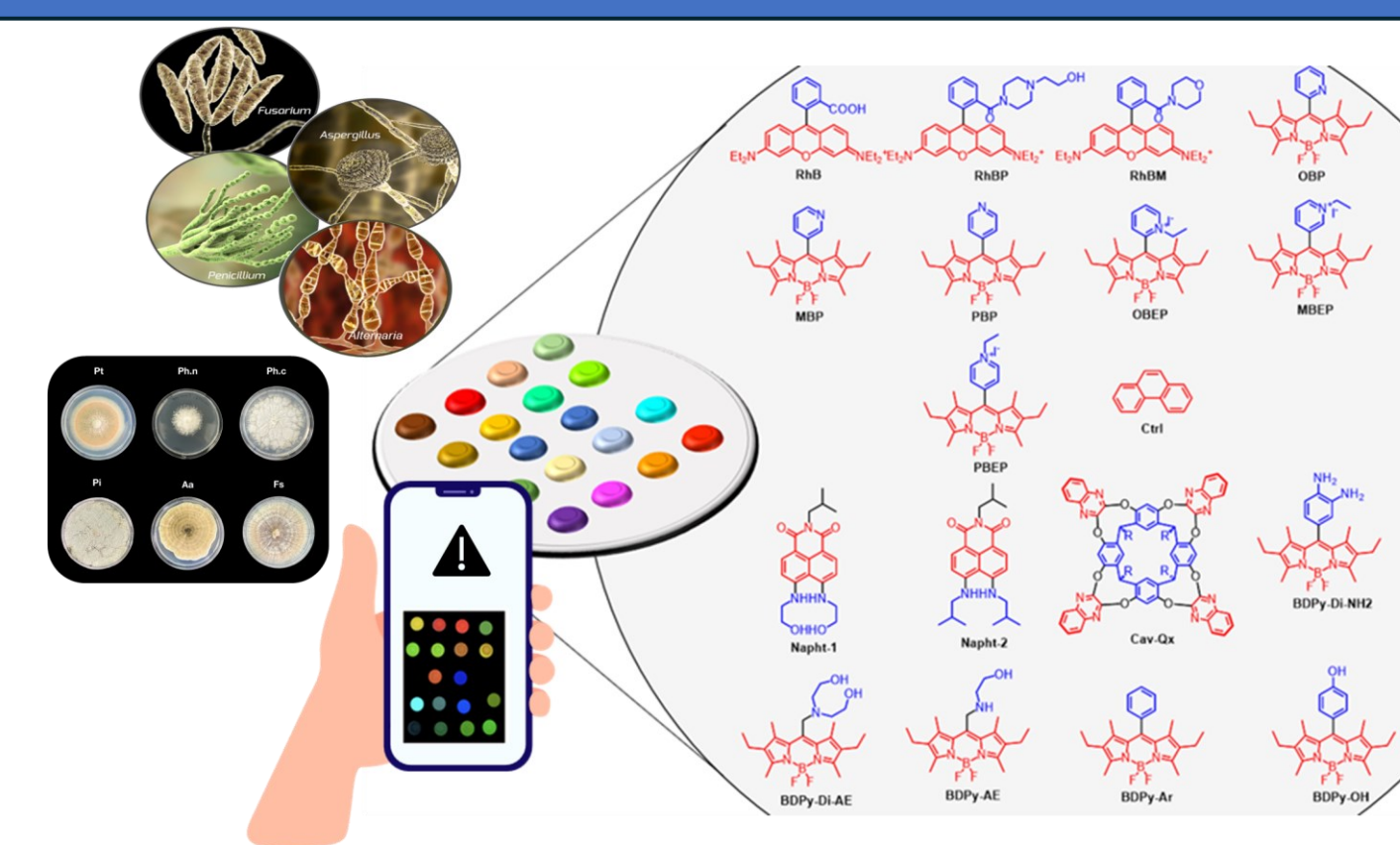
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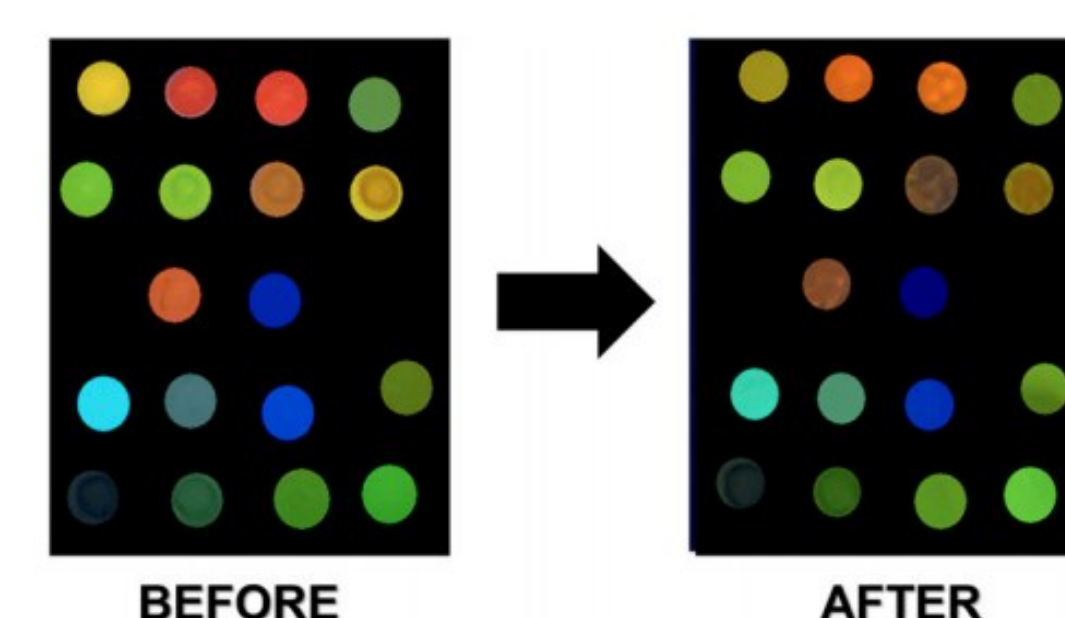
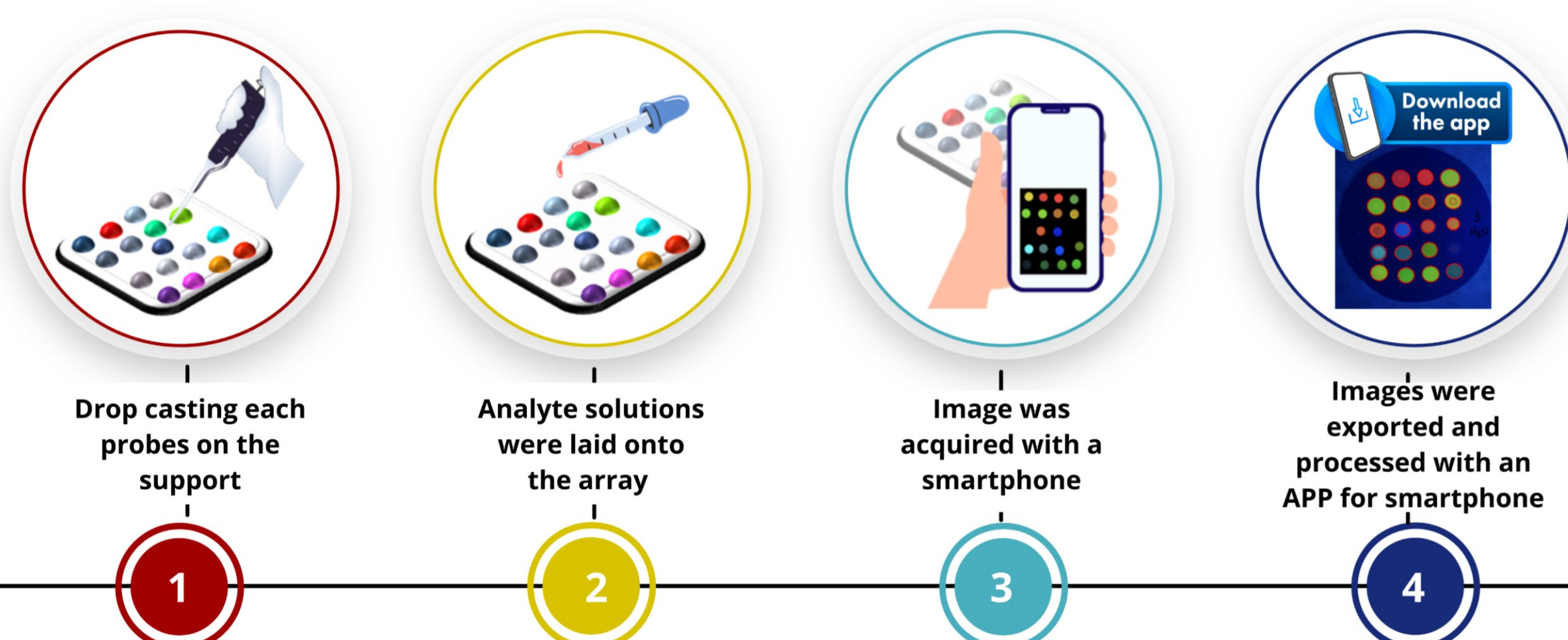
## SPOKE 1

### INTRODUCTION

The detection and the identification of plant pathogenic fungi is very important for food safety and human health. This work presents a fluorescent array sensor with organic receptors designed to selectively detect *Penicillium italicum*, *Alternaria alternata* and *Fusarium sacchari*. Notably, the sensor enables detection via a smartphone, marking the first case of using a smartphone as a detector for microscopic plant fungal pathogens. The study is used as a *proof-of-concept* for practical sensor devices that can ensure food and human health safety by detecting pathogens in plant products, food or environmental samples.



### RESULTS AND DISCUSSIONS



Real images acquired by smartphone under UV excitation (365 nm) of array before (left) and after (right) the exposure to *P. italicum*.

### QUANTIFICATION TEST

The detection limit of *P. italicum* by the array was tested.

- 1) starting with a stock solution of  $1.7-2.0 \times 10^6$  conidia  $\text{mL}^{-1}$ .
- 2) then a serial dilution was prepared (1/10, 1/1000 and 1/10000).
- 3) the response of the array to each dilution was tested.

The detection limit of *P. italicum*:  
 $1.7-2.0 \times 10^3$  conidia  $\text{mL}^{-1}$

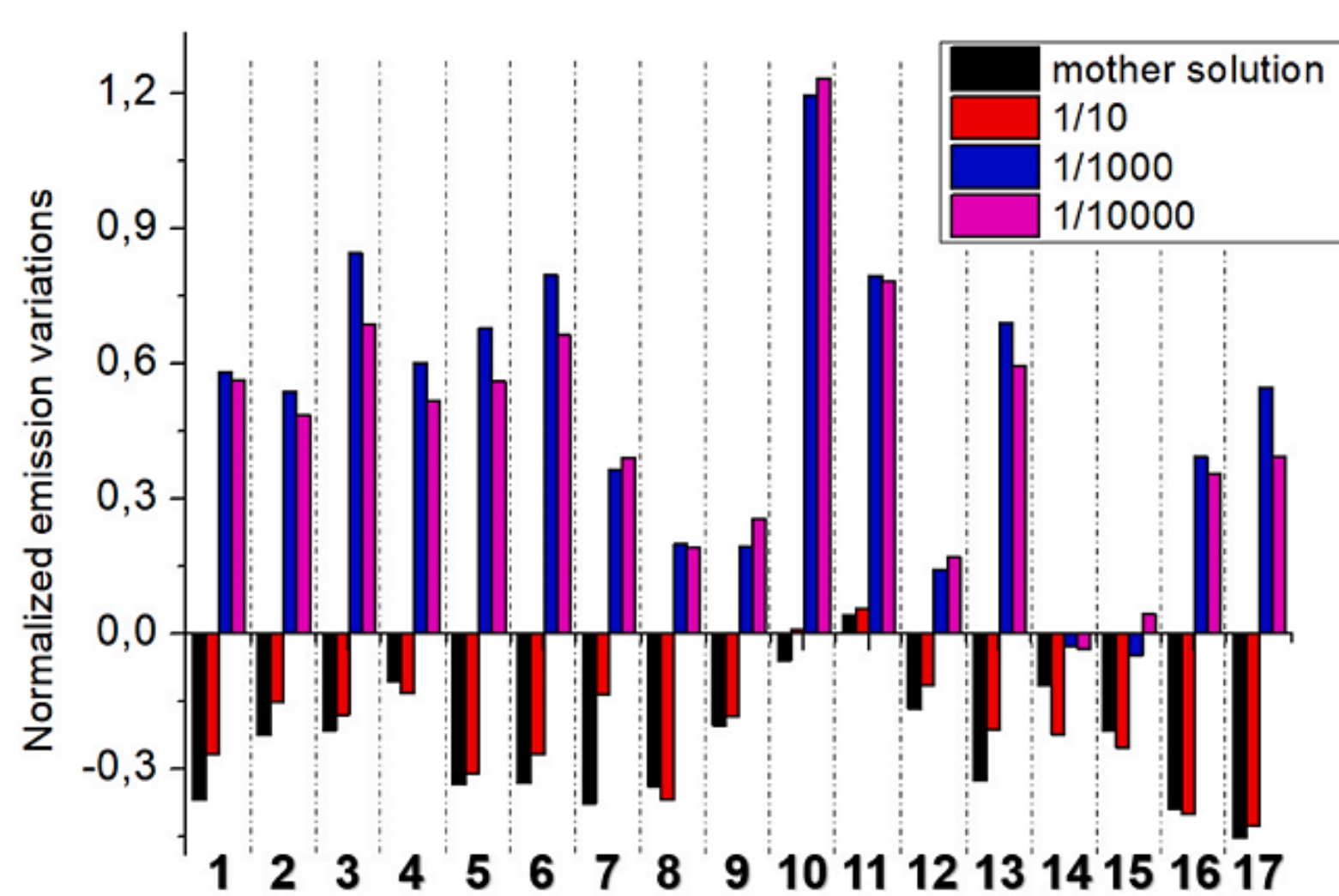
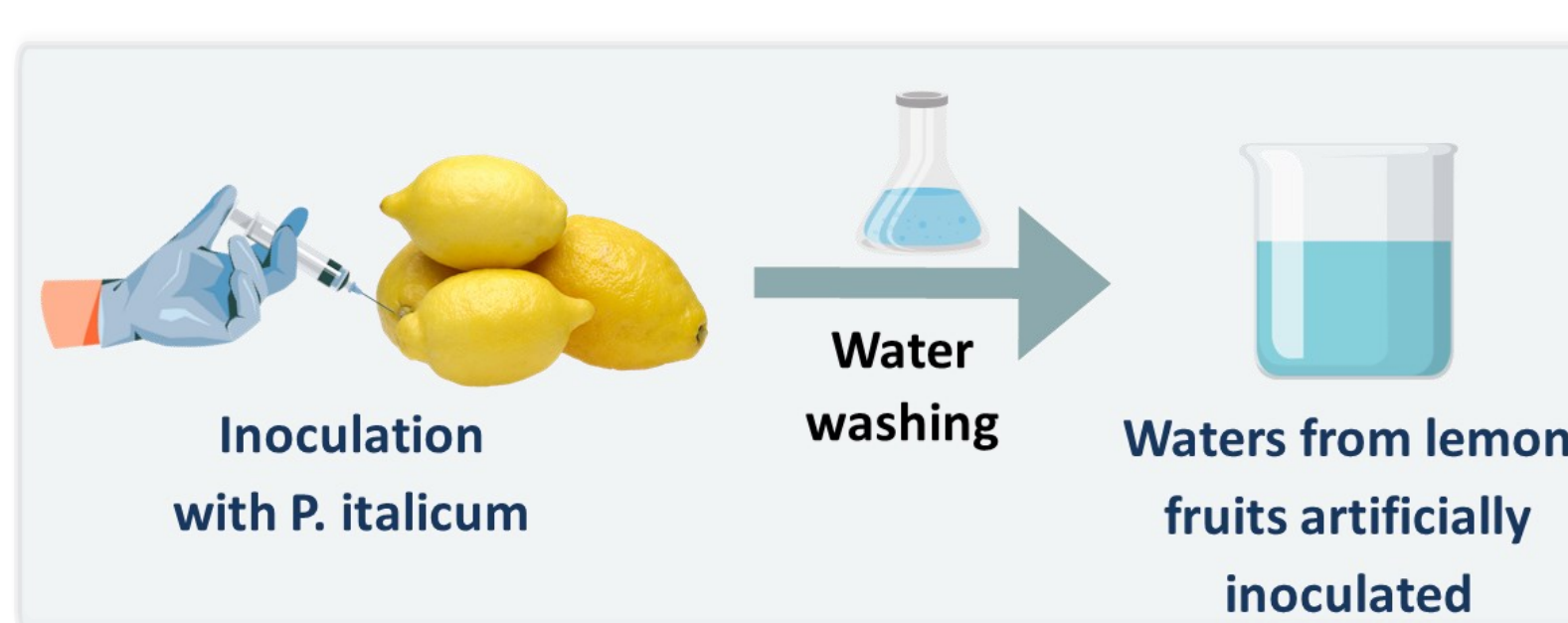


Figure shows the results of the test.

### REAL USE OF THE ARRAY



Legend: Red bar = Washing waters; Black bar = *P. italicum* mother solution  $1.7-2.0 \times 10^6$  conidia  $\text{mL}^{-1}$

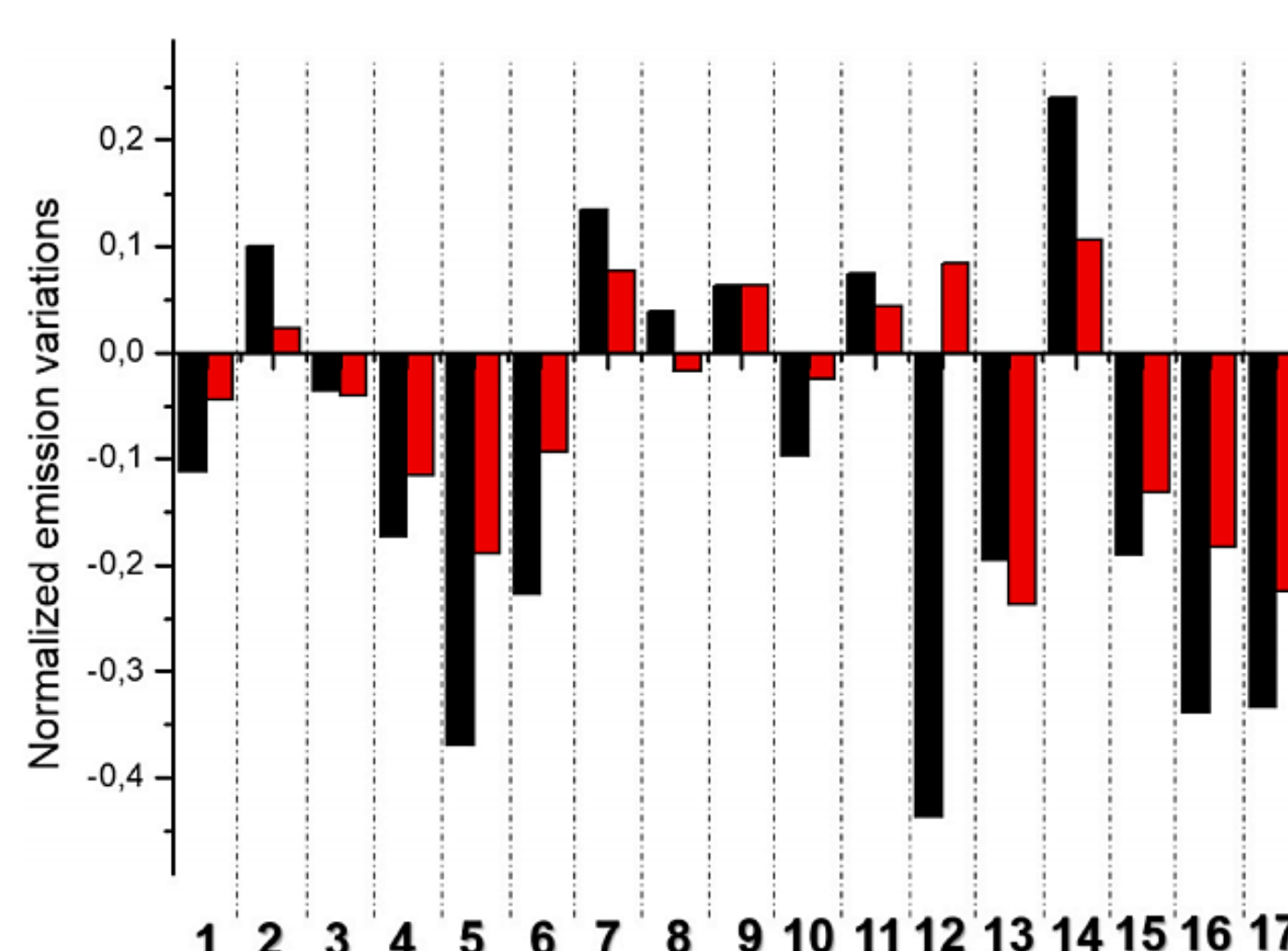
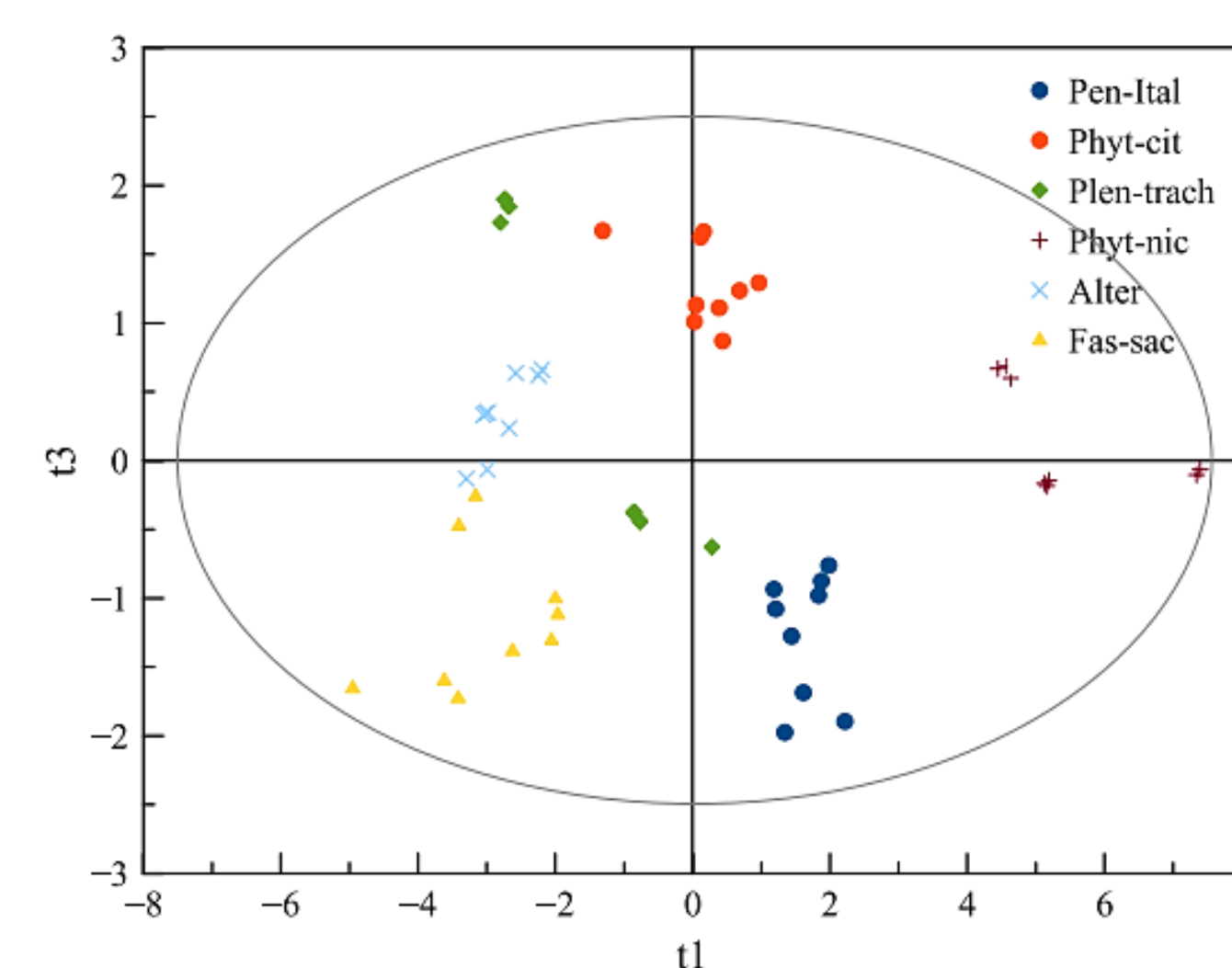


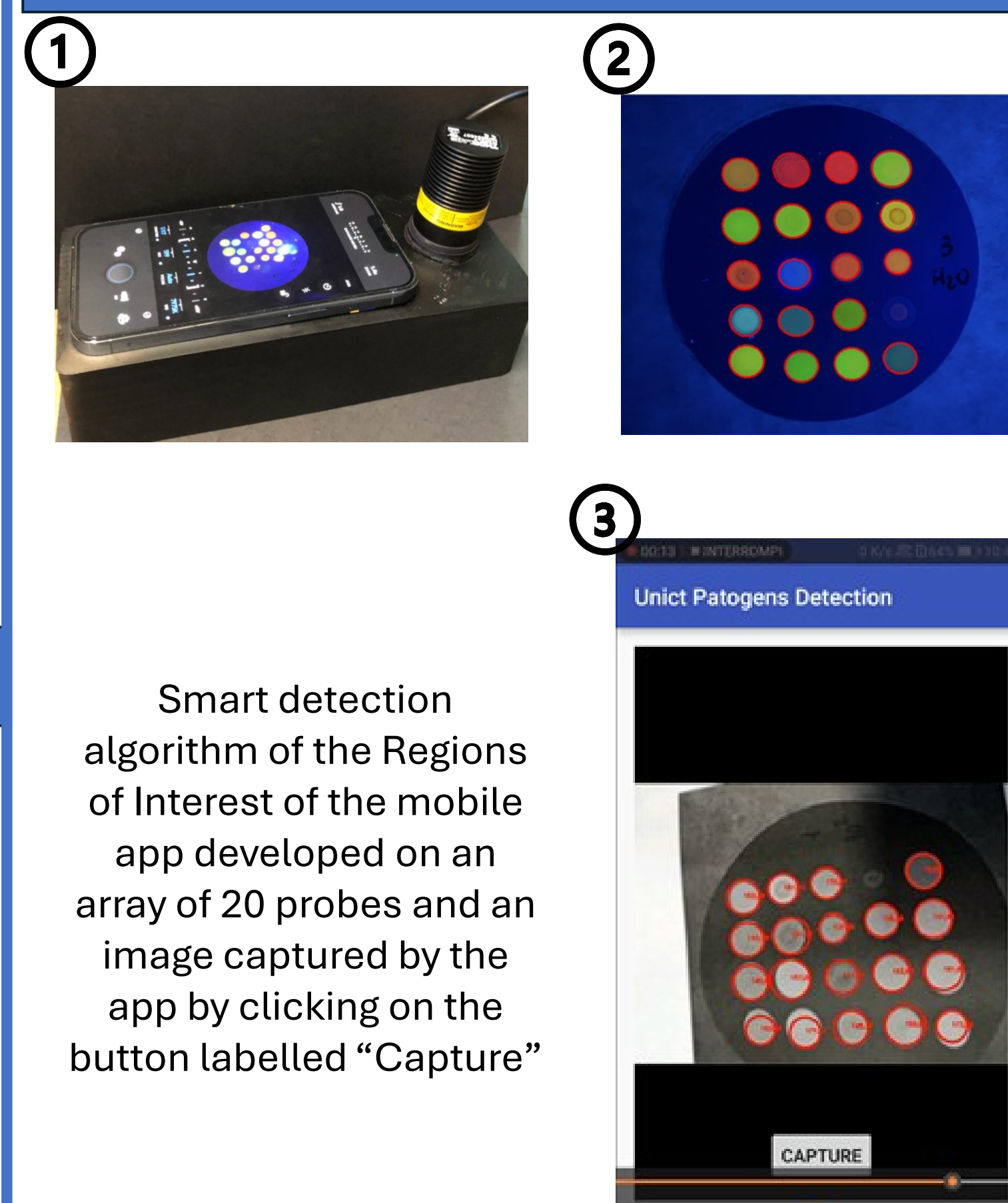
Image shows the comparison between results obtained with the washing waters (red bars) and *P. italicum* mother solution (black bars,  $1.7-2.0 \times 10^6$  conidia  $\text{mL}^{-1}$ ) previously.

### SELECTIVITY TEST



We found a very good clustering and discrimination of the several fungi under investigation.

### METHOD BY SMARTPHONE



Smart detection algorithm of the Regions of Interest of the mobile app developed on an array of 20 probes and an image captured by the app by clicking on the button labelled "Capture"

### CONCLUSIONS

- ✓ This study represents a *proof-of-concept* for the realization of practical sensor-based devices for the detection of fungal pathogens in plant products, food, and environmental samples (soil and water).
- ✓ The detection system showed a marked selectivity for some fungal genera, specific tests are necessary to validate its reliability in discriminating a target species in the framework of a communities of different microorganisms, such as the microbiome associated to fruits and food matrices in packinghouses.

### FUTURE PERSPECTIVES

- ✓ Detection of fungal propagules in environmental samples;
- ✓ Improving the reproducibility of results obtained with standard fungal solutions;
- ✓ Increasing the number of pathogens.
- ✓ Quantifying the quantity of the target pathogen.
- ✓ **Specific SmartBox for field analysis**