# Lab-on-chip for phytopathogen monitoring

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Recently, with globalization and climate change, in Europe there have been several epidemic outbreaks of phytopathogens such as bacteria, viruses and nematodes, considered a serious threat to agriculture. *Xylella fastidiosa* subsp. *Pauca* is considered one of the most dangerous and expected to have an impact of 1.9-5.2 billion euros in Italy [1]: it has spread very rapidly in the Salento peninsula, attacking the olive trees, destroying the landscape and causing a crisis in olive oil production [2] [3]. Equally, *Grapevine leafroll-associated virus 3* (GLRaV-3) and *Grapevine fanleaf virus* (GFLV) affect grapevines at leaf level, compromising their survival and causing, worldwide, huge crop losses. Border controls and conventional diagnostic techniques are not sufficient for containment; thus, reliable diagnostic approaches are needed. Lab-on-a-Chip (LOC) technologies represent a promising strategy to enable rapid, simple, sensitive, versatile monitoring [2].

In this respect, our research group recently optimized a LOC based on impedance spectroscopy for the detection of GLRaV-3 and GFLV through a sensing module consisting of electrodes functionalized with specific antibodies [4]. Compared to a traditional serological method (ELISA), the results, confirmed our LOC as an innovative technology for on-field monitoring. Recently, SAW transducers were also employed for this purpose, exhibiting superior performance [5].

Finally, as a further approach, we are working on a miniaturized qPCR system for an on-field detection. In this case, a printed circuit board (PCB) integrates a miniaturized heater, temperature sensors and a fan to perform the Real-time PCR thermal cycling. With an intuitive software in Labview, it is possible to control of all process steps and detect *X. fastidiosa* by a laser and a detector integrated in the sample miniaturized system.

## Bibliografia

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