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Abstract

Lab-on-Chip Platform for On-Field Analysis of Grapevine Leafroll-Associated Virus 3 †

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Phytopathological adversities are often attributable to human activities (as a consequence of the globalization of trade or tourism mass, changes in common agricultural practices and climate change), resulting in food losses due to pathogens such as fungi, bacteria, viruses, etc. For this reason, we are developing lab-on-chip devices as diagnostic tools to identify and manage phytopathological problems caused by infectious agents capable of spreading in agro-ecosystems, such as the *Xylella fastidiosa* epidemic in Puglia [1] or other bacteriosis and virosis such as Grapevine leafroll-associated virus 3 (GLRaV-3). In particular, grapevine leafroll disease (GLD) is one of the most important grapevine viral diseases, affecting grapevines worldwide. Several viruses from the family Closteroviridae are associated with it and Grapevine leafroll-associated virus 3(GLRaV-3) is considered as the most important causative agent. Symptoms of GLD can vary greatly with the season, grape cultivar, and climatic conditions and some varieties can be completely symptomless [2]. There is no cure for the virus but only preventive actions. In fact, the current fighting strategy is based exclusively on the use of plant material free from virus, such as the use of certified material. These pathogens can have serious economic and environmental repercussions on two of the major cultivated woody plant of Mediterranean basin, due to the absence of therapeutic techniques and the need of rapid, in-field and low-cost detection methods. Here, we present a lab-on-chip platform coupled with microfluidic module, based on an electrochemical transduction method, able to recognize serial dilutions of Grapevine leafroll-associated virus 3. LOC represents smart and versatile devices due to their miniaturization. They require small sample volumes, allowing a rapid detection of the targets, offering also the opportunity to study biomechanical properties of plants [3] and other plant cells studies [4,5]. In particular, thanks to the aid of a microfluidic module, it is possible to perform conventional laboratories functions such as sample preparation, reaction, separation and detection [6]. This device can show competitive performances with conventional diagnostic methods in terms of reliability, with further advantages of portability, low costs and ease of use, making the difference in real-time detection and management of the pathogens.

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