

Innovative diagnostics for plant pathogen detection

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Rapid and reliable diagnostic methods for plant pathogens allow for a rational and efficient use of plant protection products. Traditional detection methods based on visual assessment of plant symptoms, isolation, culturing in selective media, and direct microscopic observation of pathogens are frequently laborious, time-consuming and require extensive knowledge of classical taxonomy. Molecular techniques are faster, more specific, sensitive, and accurate than traditional techniques [1]. Plant viral and bacterial diagnostics have been traditionally based on serological methods, such as ELISA or Lateral Flow Devices. Different molecular techniques (qPCR, digital PCR, microarray) have been developed, optimized and validated in the last years with different applications to plant pathogen detection and identification [2]. A qPCR could be applied for early detection of asymptomatic samples, thanks to its sensitivity. In-field detection methods need to be specific and sensitive, easy to be interpreted and simple for the end-user. Isothermal methods, such as loop-mediated isothermal amplification (LAMP), present some advantages in contrast to PCR-based methods. One of the critical points of on-site detection consists in the use of simple and user-friendly nucleic acid extraction procedure, involving a low number of steps [3]. Innovative directions of diagnostics are the miniaturization of the molecular analysis with lab-on-chip technology and the online analysis through nanosensors. Besides, also metabarcoding and metagenomics could be exploited for monitoring, detection, and surveillance of plant pathogens [4], but also to study their epidemiology, which is important to develop adequate management strategies. The choice of the diagnostic technique depends on the balance between reliability and cost.

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