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Advanced diagnostics tools to detect and study the epidemiology of postharvest pathogens

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Abstract

Fruit and nuts can be attacked by different pathogens during the postharvest phase. Some fungal pathogens can infect the host during the postharvest phase, whereas other penetrate the fruit in preharvest and develop symptoms during the fruit storage. Molecular diagnostics is an effective tool to detect postharvest pathogens. One of the most critical points in the DNA-based methods is the selection of a correct genetic marker or barcode, which is informative enough to obtain a species-level identification or even sub-species identification. Primers and probes should be designed to amplify the target DNA for a qualitative or quantitative polymerase chain reaction (PCR or qPCR). 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. Examples of recently developed diagnostic tools for *Aspergillus flavus*, *Monilinia fructicola* and *Venturia inaequalis* will be considered. Besides, also metabarcoding and metagenomics have the potential to be used to monitor and detect postharvest pathogens, but also to study their epidemiology. Metabarcoding has been used to clarify the main agents of white haze and to understand when *Ramularia mali*, the agent of dry lenticel rot, appear on or in the fruit. These findings provide interesting information about the epidemiology of some postharvest pathogens, which is important to develop specific diagnostics and adequate management strategies.

Keywords: Diagnostics, postharvest, pathogens, PCR, qPCR, LAMP, metagenomics, metabarcoding