Molecular and metabolic strategies for postharvest detection of heat-resistant fungus *Neosartorya fischeri* and its discrimination from *Aspergillus fumigatus*

Giorgia Pertile, Magdalena Frąc, Emilia Fornal, Karolina Oszust, Agata Gryta and Takaski Yaguchi

Postharvest Biology and Technology, Volume 161, March 2020, 111082

Abstract

Heat Resistant Fungi (HRF) and toxigenic fungi are considered as a serious problem both in the agricultural field and for human health, due to ascospores and mycotoxins production, which can contaminate fruit and, as a consequence, adversely affect the agricultural food chain. One strategy to identify these fungi is the use of modern molecular method, which include the analysis of DNA target regions for differentiation of the fungal species. However, previously developed methods included only the identification of pure strains but not the detection of *Neosartorya fischeri* in artificially contaminated food samples, such as fruit or juices. Therefore, the aim of presented study was to develop a detection method of *Neosartorya fischeri* in contaminated strawberry fruit and juice. The other strategy is the use of phenotypic assays to determine the metabolic profile of the fungi in order to facilitate a qualitative and quantitative detection of microorganisms based on specific substrates utilization and mycotoxins production. Accordingly, the study included an evaluation of the differences in phenotype profile between *N. fischeri* and the phylogenetically close fungus *Aspergillus fumigatus*, as a strategy of their differentiation and identification.

PCR detection assay was developed that revealed the presence of *N. fischeri* DNA in all tested contaminated samples of fruit and juice. Therefore, it can be concluded that this rapid molecular method is an important tool for the evaluation of the postharvest quality of agricultural raw materials. Moreover, the results suggest that specific metabolic and mycotoxin patterns may be used as *N. fischeri* detection markers and strategy in discrimination of this fungus from *A.*

fumigatus. The results indicated that *N. fischeri* and *A. fumigatus* had a different time period of carbon sources utilization, and particularly *N. fischeri* presented a more efficient carbon metabolism. Mycotoxins, verruculogen and fumitremorgin C, were detected after 4 days incubation of *N. fischeri*. Although metabolic assays are not such fast as molecular detection approach, they allow to deeper insight into the pathways activated by heat-resistant and toxigenic fungi. Therefore, both molecular and metabolic strategies of heat-resistant fungus detection and identification are complementary and can be used to measure postharvest quality of fruit and their products.