

An assessment of the air quality in apple warehouses: new records of *Aspergillus europaeus*, *Aspergillus pulverulentus*, *Penicillium allii* and *Penicillium sumatraense* as decay agents

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Abstract

Airborne fungi are one of the major components of aeromycobiota known to produce several fungal diseases in fruits. Their presence in indoor environment of warehouses may limit the storage period of apples. Qualitative and quantitative analyses of airborne fungal spores were conducted using gravity settling techniques to detect fungal airspora present in the atmosphere of two apple warehouses in Tunisia. In this study, 375 fungal isolates were obtained and purified. Phylogenetic analysis of calmodulin, beta-tubulin and ITS regions coupled with phenotypic characterization helped to identify 15 fungal species. *Penicillium* exhibited the highest diversity with ten species detected (*Penicillium allii*, *P. chrysogenum*, *P. citrinum*, *P. expansum*, *P. italicum*, *P. polonicum*, *P. solitum*, *P. steckii*, *P. sumatraense* and *P. viridicatum*), followed by four species of *Aspergillus* genus (*Aspergillus europaeus*, *A. flavus*, *A. niger* and *A. pulverulentus*) and *Alternaria alternata*. In vivo experiments confirmed the pathogenicity of 13 species at room temperature and under cold-storage conditions. Among them, *A. europaeus*, *A. pulverulentus*, *P. allii* and *P. sumatraense* were described for the first time as pathogens on apples. The present study identified the major airborne fungi associated with postharvest rot in apple storage facilities in Tunisia and may help in efficient control of postharvest and storage fruit diseases.