

# Air filtration systems for controlling fungal contamination in pear warehouses: an overview of the REPEAR project

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Air filtration systems are applied in industrial environments in which hygiene standards are strict, such as healthcare and food environments. Applications of these systems in food processing environments include product protection from fungal spores, dust or any other contaminants while it is in clean rooms or in packaging lines (1). The aim of this work was to design and develop a novel air filtration system coated with ZnO nanoparticles, able to trap and neutralize fungal spores in pear warehouses.

The growth dynamics of fungal contaminants were quantitatively assessed by the use of predictive mycology modelling tools while their sensitivity in the presence of ZnO nanoparticles was also assessed. Their antifungal action was elucidated microscopically by the use of Scanning Electron Microscopy (SEM) (Figure 1) and macroscopically by spectrophotometric analysis. Hereafter, a binary response methodology for identifying the most effective coating conditions, i.e. nanoparticle concentration and coating time, for the inhibition of fungal conidial suspensions was implemented. A filter prototype coated with ZnO nanoparticles was finally tested under real conditions of an acclimatized pear warehouse.

The results have shown that *Rhizopus stolonifer* was the most aggressive fungal isolate under optimal temperature conditions. On the other hand, *Penicillium expansum* was the most sensitive organism, with no growth reported for the filters coated by immersion in a 12 mM ZnO nanoparticles suspension for 0.5 min. The developed air filters after an operation of six months effectively trapped any microbial contaminants, while surface contaminants were reported to be at low levels. This research proves that filtration systems coated with nanoparticle solutions stand as an effective post-harvest intervention strategy.

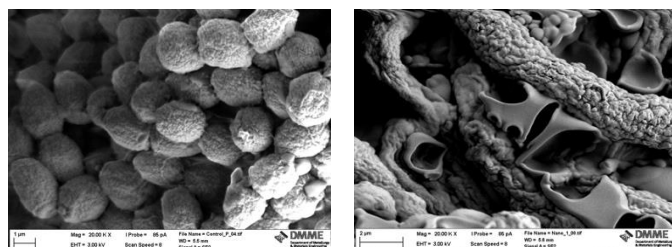


Figure 1: SEM images of *P. expansum*, without (left) and with (right) 12 mM ZnO NPs, respectively.

## References:

1. J.-P. Brincat, D. Sardella, A. Muscat, S. Decelis, J.N. Grima, V.P. Valdramidis, R. Gatt, *T. Food Sci. Technol.* **50**, 175 (2016)