TITLE: POLYVINYL ACETATE NANOFIBERS FUNCTIONALIZED WITH NATAMYCIN FOR INHIBITING OF FOOD SPOILAGE FUNGI

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ABSTRACT

The presence of undesirable microorganisms in food deserves attention due to negative impact on food quality and safety. Some fungi have been associated with spoilage of foods and beverages, causing changes in the chemical, physical and sensory properties of the products. In addition, certain filamentous fungi are able to produce mycotoxins. Such fungal metabolites exhibit carcinogenic, mutagenic and teratogenic properties and therefore pose health risks. New strategies for fungal growth control and prevention are required. Nanostructures, including nanofibers, can be used for delivery and controlled release of antimicrobial drugs, reducing the drug amount and promoting a more effective action. Nanofiber based films have an application prospect in the field of functional food packaging. The objective of this study was to produce polyvinyl acetate (PVAc) nanofibers loaded with natamycin by electrospinning technique. The nanofibers were also tested against yeasts and filamentous fungi, including toxigenic isolates. PVAc was dissolved in an organic solution containing 0.5% natamycin. During electrospinning process, a 0.5 mm internal diameter needle was used, the applied voltage was 25 kV and the polymer feeding rate was set to 0.05 ml/min. Nanofibers without natamycin were developed as control. The surface morphology of nanofibers was observed by scanning electron microscopy. The material was tested against 5 filamentous fungi (*Aspergillus flavus*, *A. niger*, *A. carbonarius*, *Penicillium citrinum* and *P. roqueforti*) and 5 yeasts (*Saccharomyces cerevisiae*, *Candida albicans*, *C. krusei*, *C. parapsilosis* and *Pichia* sp.) by depositing on the surface of Petri dishes containing Potato Dextrose Agar. The inhibition zones were measured after 7 days or 24 hours of incubation at 30 °C for filamentous fungi or yeasts, respectively. Electrospun nanofibers presented a smooth and bead-free morphology and the mean diameter was 885 nm. A decrease in mean nanofibers diameter (719 nm) was noted after adding natamycin in the polymer formulation. Natamycin-functionalized nanofibers showed activity against all fungi tested. Inhibition zones between 2.1 and 13.6 mm were observed against the filamentous fungi, being *A. carbonarius* (an ochratoxin A producing strain) the most sensitive. The yeasts presented growth inhibition zones ranging from 9.4 to 12.9 mm. The results suggest PVAc nanofibers incorporating natamycin have potential application for reducing toxigenic and spoilage fungi.

Keywords: Electrospinning, Fibrous membrane, antifungal activity, toxigenic fungi, spoilage yeasts

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