Reference

284

Kinetic and morphometric evaluation of fucoidan-degrading fungal strains

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Abstract

Fucoidan is a sulfated fucose hetero-polysaccharide found in brown algae. This compound has a wide variety of biological activities including anticoagulant, antithrombotic, antitumoral and antiviral (Alexeeva et al. 2002; Ellouali et al. 1993; McClure et al. 1992). Specific enzymes able to degrade fucoidan matrix are important tools to establish structural characteristics and biological functions of this polysaccharide. Such enzymes, called fucoidanases, have been only isolated from marine organisms (Sakai et al. 2004; Giordano et al. 2006). Reports of fungal microorganisms with enzymatic activity over this sulfated-polysaccharide are scarce.

Mycelial growth and morphology of filamentous fungi can be mathematically described by kinetic models, through the estimation of specific growth rate of molds on plates containing target polysaccharide as sole carbon source, using image processing techniques (Loera and Viniegra 1998). In this sense, the aim of this work was to identify fungal strains able to growth over fucoidan media as sources of active fucoidanases, by quantification of kinetic and morphology features, to establish the influence of media composition on growth patterns.

Aspergillus niger PSH, *Penicillium purpurogenum* GH2 and *Mucor sp.* 3P were the screened strains. Different culture media with and without mineral salts were tested for microbial growth. Fucoidan of *Laminaria japonica* and urea were used as carbon and nitrogen source. Radial growth rate (U_r) was kinetically monitored measuring colony diameters. Hyphal length (L_{av}) and diameter (D_h) were quantified by image analyses measurements.

All the evaluated strains were able to growth on different fucoidan-urea media, and their plate invasion capacity and radial growth rate were directly proportional to measured morphometric parameters. The three fungi strains synthesize acting metabolites toward fucoidan matrix, and are important tools for the synthesis of sulfated fucan-degrading enzymes. These results are, until now, the first report of enzymes able to growth and degrade fucoidan obtained by terrestrial fungus.

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