Bioreduction of carboxylic acids and esters by using filamentous fungi: novel carboxylic acid reductase activities.

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The reduction of carboxylic acids and esters to primary alcohols is a key reaction in organic chemistry with widespread application in the manufacturing processes of fine and bulk chemicals. Currently these reactions are performed with traditional chemical methods exploiting metal hydride reagents and their derivatives, which may require extensive heating and are very polluting and unsafe causing several drawbacks in the work up. Biocatalysis may be a viable alternative to traditional chemical synthesis due to its ecological and economical sustainability. In this regard, carboxylic acid reductases are enzymes that catalyse the reduction of carboxylic acids to the corresponding aldehydes. However, the low redox potential of these substrates makes them difficult to be reduced by bio-based methods. Actually, these enzymes were identified in anaerobe and hyperthermophile bacteria. Little information about putative carboxylic acid reductase activities was reported in filamentous fungi. The use of these microorganisms has the advantage to work in aqueous medium at room temperature and pressure.
This study aims to identify filamentous fungi with carboxylic acids reductases activities in the bioconversion of methyl cinnamate.
Only three fungi out of 28 were able to convert methylcinnamate. *Mucor circinelloides* almost totally converted this substrate in 3-phenylpropanol, *Syncephalastrum racemosum* totally converted this substrate in 3-phenylpropanol and benzylic alcohol and *Mucor plumbeus* poorly reduced methyl cinnamate.
Future investigations will be done to define the basic structural scaffold of the substrates that could be accepted by *Mucor circinelloides* and *Syncephalastrum racemosum.* For these fungi it will be important to establish if this peculiar reducing activity is strain dependent. Regarding the fungus *Mucor circinelloides,* bioinformatic and molecular analyses of putative genes coding for carboxylic acids reductases will be performed.