Reduction of the phenolic components in olive-mill wastewater by an enzymatic treatment and its impact on durum wheat (*Triticum durum* Desf.) germinability

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Abstract

Olive-mill wastewater (OMW), an effluent of olive oil extraction process, is annually produced in huge amounts in olive growing areas. An interesting option for its disposal is the spreading on agricultural land, provided that phytotoxic effects are neutralized. The objective of the present investigation was to evaluate the potential of an enzyme-based treatment in removing OMW phytotoxicity. To this aim, germinability experiments on durum wheat (*Triticum durum* Desf. cv. Duilio) were conducted in the presence of different dilutions of raw or enzyme-treated OMW.

OMW treatment with laccase resulted in a 65% and 86% reduction in total phenols and *ortho*-diphenols respectively, due their polymerization as revealed by size-exclusion chromatography.

Raw OMW exerted a significant concentration-dependent inhibition on the germinability of durum wheat seeds which was evident up to a dilution rate of 1:8.

When the effluent was treated with a fungal laccase, germinability was increased by 57% at a 1:8 dilution and by 94% at a 1:2 dilution, as compared to the same dilutions using untreated OMW. The treatment with laccase also decreased the mean germination time by about 1 day as compared to untreated controls.

These results show that germinability inhibition due to OMW can be reduced effectively using fungal laccase, suggesting that phenols are the main determinants of its phytotoxicity.

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1. Introduction

Olive-mill wastewater (OMW) is a by-product of the olive oil extraction process. Around 30 million m³ of OMW are produced annually in the Mediterranean area,

causing environmental concern. The disposal of this waste is regulated according to guidelines and standards aimed at evaluating the quality of industrial wastewater in view of the safeguard of aquatic ecosystems (Tomati, 2001). A valid alternative to the discharge of OMW into water bodies is the spreading on the land. In Italy, the legislation provides guidelines for OMW disposal on agricultural soils and recently a special permission allows the land spreading of this waste also in Portugal. However this practice is performed illegally in several

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