

BOOK
OF
ABSTRACTS

WASTES

solutions treatments opportunities

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WASTES: Solutions, Treatments and Opportunities**

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AUTHORS

Fernando Castro, Cândida Vilarinho, Joana Carvalho,
Alexandra Castro, Jorge Araújo, Alexandra Pedro.

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Rui Ferreira

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CVR - Centro para a Valorização de Resíduos
Campus de Azurém da Universidade do Minho
4800-058 Guimarães
PORTUGAL

Telef.: +351 253 510 020

Fax: +351 253 510 029

<http://www.cvresiduos.pt>

e-mail: geral@cvresiduos.pt



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SEARCHING FOR OLIVE MILL WASTE WATER (OMWW) SOLUTIONS: IS THERE A POTENTIAL ON MICROALGAE TREATMENT?

Silva, Olinda [1], Victor, Vasconcelos [2], Aires, Alfredo [3], Fernandes, Conceição [4][a] [1] Mountain Research Centre (CIMO),

ESA-Polytechnic Institute of Bragança, Portugal

[2] Interdisciplinary Centre for Marine and Environmental Research (CIIMAR/CIMAR), Faculty of Sciences-Porto University, Portugal

[3] Centre for Research and Technology for Agro-Environment and Biological Sciences (CITAB), University of Trás-os-Montes e Alto Douro, Portugal.

[4] Mountain Research Centre (CIMO), ESA-Polytechnic Institute of Bragança, Portugal

[a] conceicao.fernandes@ipb.pt

ABSTRACT

Olive Mill Waste Water (OMWW) is the principal industry extraction residue of olive oil and still one of the most serious environmental problems. Toxicity of this effluent is mainly due to high levels of phenolic compounds and low pH, thus OMWW direct disposal may pollute both, land and aquatic environments [1].

A variety of biological processes have been tested to reduce OMWW phenolic compounds. Several studies were carried out with different bacteria [2,3] yeasts [4,5] and fungi [6,7], but in general their effectiveness in reducing OMWW toxicity varies greatly.

From our knowledge, apparently OMWW treatment methods with microalgae are a pioneering technique. Previous work developed in the Polytechnic Institute of Bragança, have shown that *Chlorella vulgaris* has ability for growing in medium supplemented with several phenolic compounds [8, 9]. Therefore, to reduce OMWW toxicity, we intended to evaluate the growth of *C. vulgaris* under different OMWW concentrations and assess its phenolic content variations.

Several assays were performed *in vitro* under axenic conditions, using diluted OMWW. Screening of growth was conducted on solid agar. Three different densities of *Chlorella vulgaris* (CBSC 15-2075) were plated on agar solid with five OMWW dilutions (5%, 10%, 20%, 30% and 40%). Incubation was done in a controlled chamber, with temperature of 22 ± 1 °C, light intensity of 4500 lux and 16h:8h light:dark. The algae growth was assessed by comparison with control growth (Walne Modified medium) after 4, 7 and 12 days.

Based on these results (Figure 1), batch cultures were conducted with 20% and 40% of diluted OMWW, inoculated with pre-adapted cultures (5% OMWW), to medium algae concentration. Flasks were incubated in the controlled growth chamber, with continuous light and aeration. Growth assessment of *C. vulgaris* was made by cell counting and chlorophyll a content. Total phenols variation with time, was measured by Folin-Ciocalteu assay. Samples were taken, in the beginning and at the end of each experimental set, for individual phenolic content analysis by HPLC-MS, with Diode array detector.

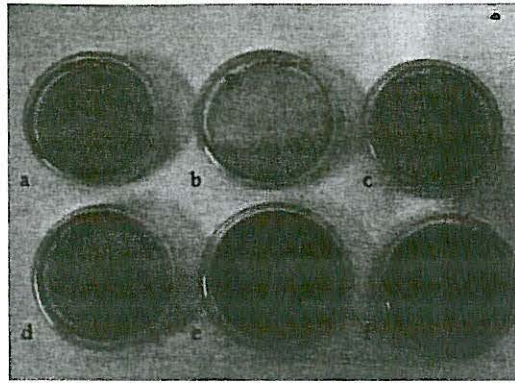


Figure 1 - Comparison of *Chlorella vulgaris* growth after 12d incubation: Waine Modified medium (a), OMWW dilutions (b=5%, c=10%, d=20%, e=30%, f=40%).

Results of *C. vulgaris* growing in diluted OMWW showed that, although a low specific growth rates, cells increased slowly during fermentation, reaching a growth index of 1.3 after 20 days, suggesting a potential reduction in OMWW polyphenol levels, which are responsible for toxicity. In fact a decrease in total phenolic content with time was observed, for the two concentrations tested.

Incorporation of biological processes on OMWW can provide some of the most viable options for treatment. However, further researches are in course in order to test high OMWW dilutions, as well as to optimise phenolic compounds removal.

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[+] "Olive mill waste water"; [-] "microalgae";
 [-] "toxicity reduction"; [-] "phenolic content"