The International Association of Mediterranean Agro-Industrial Wastes

www.iamawaste.org

IAMAW

Book of Abstracts

IAMAW 1st INTERNATIONAL WORKSHOP

"VALORIZATION OF MEDITERRANEAN BIOWASTES AND EFFLUENTS"

5 TO 8 JUNE 2012

Centro Nacional de Exposições

SANTARÉM, PORTUGAL

This event has the high patronage of
Ministério da Agricultura, do Mar, do Ambiente e do Ordenamento do Território
from the Portuguese Government

Welcome

The IAMAW is proud to welcome you to this event that addresses R&D developments for the environment protection of the typical Mediterranean landscapes with an emphasis on resources protection and valorization of wastes and effluents for "biorefineries" and for water recycling. When the EC is announcing the need for a third Industrial Revolution we believe that renewable resources and wastes valorization will be on the lead.

We hope that this event will bring together not only IAMAW, SPBT and SIADEB membership but also all the scientists and other stakeholders that can share with us their work and vision contributing for the environmental and economical sustainability of our economies and the progress of the Mediterranean Region.

SIADEB	IAMAW	SPBT
Francisco Gírio	*José Cardoso Duarte*	*José António Teixeira*

Acknowledgements

The Organizing Committee of the IAMAW Workshop wants to express its most sincere thanks to the National Exhibition Centre that made this event possible.

We also want to acknowledge the support of:

LNEG-Laboratório Nacional de Energia e Geologia, IP.

Commercial Gold Sponsors:

- Águas da Figueira,SA
- UCASUL – União das Cooperativas Agrícolas do Sul
- CAP-Confederação dos Agricultores de Portugal

O19 - COAGULATION-FLOCCULATION FOR THE CHEMICAL TREATMENT FOR THE OLIVE MILL EFFLUENT AND RECOVERY OF THE HIGH ADDED VALUE PHENOLIC COMPOUNDS FROM THE EFFLUENT BY USING SOLVENT EXTRACTION

*P. Papaphilippou[1], M. Politi[2], V. Daskalaki[2], D. Mantzavinos[*2], N. Kalogerakis[2], D. Fatta-Kassinos[**1]*

[1]Department of Civil Engineering and Environmental Engineering, University of Cyprus, 20537, Nicosia, Cyprus. [2]Department of Environmental Engineering, Technical University of Crete, 73100, Chania, Crete, Greece. * Corresponding Author: dfatta@ucy.ac.cy

Olive mill effluent (OME) is one of the most difficult to be managed wastewater. OME is generated during the olive oil production in large volumes and consists by high polluting load. Olive oil production is significant to Mediterranean countries and therefore the research on the treatment of the OME has been intense through the last years. OME can also represent a precious resource of potentially useful polyphenols such as hydroxytyrosol (HT), tyrosol (T), oleuropein, which are of great interest in the cosmetic and pharmaceutical industries due to their antioxidant activity. This work deals with the pre-conditioning of OME by coagulation/flocculation method. The combined application of anionic polyelectrolyte with the iron salts increased the COD, TSS and TP removal, contrary to the experiments with the coagulants alone. In specific, the treatment of the OME with 5.0 g/L $FeSO_4.7H_2O$ and 0.287 g/L FLOCAN 23 (FLC) led to about 68% COD, 89% TSS and 53% TP removal, while treatment of OME with $FeCl_3$/FLC to 70% COD, 96% TSS and 48% TP removal. Phenols' recovery from synthetic solutions and OME was conducted using conventional liquid solvent extraction. By using ethyl acetate EA for the extraction of the pre-treated OME led to further increase of the TP removal. Particularly, extraction of $FeSO_4.7H_2O$/FLC with EA increases the TP removal from 40% to 86% and of $FeCl_3$/FLC from 62% to 94%.

This project is funded by Cyprus Research Promotion Foundation.

O20 – REMOVAL OF PHARMACEUTICAL COMPOUNDS BY ACTIVATED CARBON DERIVED FROM OLIVE OIL MILL RESIDUE

R. Baccar a,b,, P. Blánquez b, J. Bouzid a, M. Feki c, T. Vicent b and M. Sarrà [b]*

Laboratoire Eau Energie Environnement, Ecole Nationale d'Ingénieurs de Sfax, BP 1173-3038 Sfax-Tunisia. (b) Departament d'Enginyeria Química, Escola d'Enginyeria, Universitat Autònoma de Barcelona, Bellaterra 08193, Spain. (c) Unité de Recherche de Chimie Industrielle et Matériaux, Ecole Nationale d'Ingénieurs de Sfax, BP 1173-3038 Sfax-Tunisia. *Presenting author: Tel.: +34 93 581 4798; +216 21 250 957; fax: +34 93 581 2013; E-mail address: Rim.baccar@uab.es; Rym.baccar@tunet.tn (R. Baccar)

The present work explored the use of an activated carbon prepared from olive-waste cakes, a by-product of the manufacture process of olive oil in mills, for the removal of pharmaceutical compounds. The adsorbent prepared at the laboratory scale was fully characterized considering its adsorption properties as well as its chemical structure and morphology. Adsorption of common pharmaceuticals: ibuprofen, ketoprofen, naproxen and diclofenac have been investigated. Single and mixture drug solutions were considered. The equilibrium adsorption data obtained at 25 °C were analyzed by the Langmuir and Freundlich models. The former provides the best fit on the experimental data. The adsorption capacities of the carbon for the four drugs were quite different and were linked essentially to their pKa and their octanol/water coefficient. The adsorption kinetics of these adsorbates have been studied and discussed and the results indicated that the adsorption process followed the pseudo-second-order kinetic model for the four drugs. The effect of pH increasing gradually reduced the uptake of the four drugs, and this effect was more perceptible when the pH became alkaline. Increasing the temperature does not have a perceptible effect on the adsorption process for the studied drugs. The adsorption and desorption of the four studied pharmaceuticals on fixed bed activated carbon column will be studied.

O21- *PLEUROTUS OSTREATUS* IN THE BIOLOGICAL TREATMENT OF OLIVE OIL MILL WASTES

*D. Antunes *, A. Pereira *, A.T. Caldeira *, #, J.R. Marques da Silva $, &, J.M. Arteiro *, #*

(*) Chemistry Department University of Évora, 7000-671 Évora, Portugal. ($)Rural Engineering Department University of Évora, 7002-554 Évora (#) CQE, University of Évora, 7000-671 Évora, Portugal (&) ICAAM, University of Évora, 7002-554 Évora Portugal

Olive oil mill wastes (OMW) constitute an important environmental problem due to the large amount of phenolic compounds and the high toxicity they present. Additionally when canned olives were produced, a large amount of brine water difficult the treatment of wastes. In the present work a biological approach was applied using edible mushroom *Pleurotus ostreatus*.

The aim of this work was to characterize the working OMW and to develop a biological treatment that promotes a new approach of OMW management

The OMW was acquired from a two phase olive oil mill system which produces a combined waste composed by the olive oil production

wastewater and brine water from canned olives production. The characterization of OMW was carried out analyzing the parameters, chemical oxygen demand, pH, total kjeldahl nitrogen, total phosphorus, total phenol, alkalinity, conductivity and metal content. The biological treatment was conducted using batch cultures of *P. ostreatus* preformed in a liquid medium with 100%, 75%, 50% and 25% OMW content. The total phenolic content, biomass increase and OMW discoloration was monitored periodically, during 21 days.

P. ostreatus cultures performed with OMW showed a fungal biomass enhancement as well as medium clarification. A 50%-74% total phenol reduction was observed.

Furthermore study is needed in order to achieve the proper management of OMW. However, the biological treatment is an ecological alternative for this management, promoting further valorization of these residues.

- Pereira, A., Antunes, D., Caldeira, A. T., Marques da Silva, J. R. & Arteiro, J. M. (2011). Redução de compostos fenólicos de resíduos de lagares de azeite utilizando culturas de *Coriolus versicolor*. In *Proceedings of VI Congresso Ibérico de Agro-Engenharia* Évora - Portugal.

O22 - WINERY EFFLUENT TREATMENT WITH A JET-LOOP BIOREACTOR: FROM LAB TO THE WINERY

M. M. Lageiro[2], A. Eusébio[1], M. Mateus[1] and José Duarte[1]

1 LNEG, Laboratório Nacional de Energia e Geologia, I.P., Bioenergy Unit, Pólo do Lumiar, Estrada do Paço do Lumiar, 22, Ed. K2, 1649-038 Lisboa (jose.duarte@lneg.pt)2 INIAV, Instituto Nacional de Investigação Agrária e Veterinária, I.P., Pólo do Lumiar, Estrada do Paço do Lumiar, 22, Ed. S, 1649-038 Lisboa

Agro-industries and particularly wineries produce effluents with organic and pollutant content that shows a tremendous negative impact on the environment. As an innovating solution, a Jet-Loop Reactor (JLR) type was designed and applied in order to investigate new solutions for the effluent treatment of agro-industries.

We have built and tested a JLR, at a Portuguese winery, which main characteristics are the high unit capacity for biological conversion; operation at different loadings and prompt start after stops; reduced energy consumption on aeration; reduced volume and consequently small occupied area; reduced maintenance and competitive installation costs.

The 23 dm^3 JLR laboratorial prototype working in continuous operation, using sludge recycling and with daily sampling, proved to be a good solution for application to this type of effluents, multiplying by an order of magnitude the productivity of classic aerobic treatment.

Scale-up was made to a pilot prototype of 220 dm^3 and to an industrial prototype of 3500 dm^3 working at a Portuguese winery (height to diameter ratio of 5-10:1).

The effluents from white and red wine-making after grape harvest (Chemical Oxygen Demand (COD) between 5.2 to 27.2 kg/m^3) were used.

For the 3 reactors on-line data acquisition of pH and temperature showed a constant range without external control. A winery effluent with a loading charge of 1 – 15 kg COD/m^3 is necessary to maintain a COD removal higher than 80% and to obtain an adequate biomass concentration (higher than $3x10^9$ cell/ml and 2 g/l) inside the reactors, at a Hydraulic Retention Time (HRT) of 1 day. The increasing of dilution rate and loading charge, did not affected the values of COD_{out}. COD conversion rates increased from 2 to 29 Kg COD_{in}/m^3d and from 10 to 90% of COD removal with the increase on dilution rate (maximum 1.1 d^{-1}). The biomass concentration increased with addition of nitrogen and phosphorous sources. The COD conversion rates also increased when biomass recycling was used.

Acknowledgments:

New Reactor System for Solving the Wineries Environmental Impact Programme LIFE 96ENV/P/00602/INDW); MEDOLICO, EU Programme ENPI-CBCMED I-B/2.1/090.

O23 - DECONTAMINATION OF OLIVE OIL WASTEWATER BY UNICELLULAR GREEN ALGAE

José Duarte[1], Cristina Moreira[1], Stephka Chankova[2]

1Laboratorio National de Energia e Geologia, I.P.2Institute of Biodiversity and Ecosystem Research, BAS

Unicellular green algae may be used for biological decontamination and remediation of different polluted areas because they can adsorb, absorb, accumulate and metabolise different pollutants.

We aimed to find an integrated and economical process for the decontamination of the olive oil wastewater. Three different phases were established: the impact of olive oil wastewater on the algae growth; adaptation tests of the microalgae cultures to the olive oil wastewater and selection of the most promising ones; analysis of different parameters to monitor the treatment held by microalgae to the olive oil wastewater.

A crude Olive Oil Waste Water (OOWW) collected at an Olive Oil mill located at Oliveira do Hospital, Portugal; B-Filtered crude OOWW (0,45 µm); C-Filtered and Sterilised crude OOWW (0,45 µm and boiled for 5 min.); D-Pretreated OOWW collected at Sfax, Tunisia (ultra-filtered sample from an anaerobic reactor); E-Urban Swage collected from the outlet of a wastewater treatment plant are used. After 15, 27 and 34 days of incubation olive mill effluent treated on a Jacto Loop Reactor (pH=7.9, COD=2.8 g/L, Colour=19200 PtCo,