



MEDOLICO news

MEDITERRANEAN COOPERATION
IN THE TREATMENT AND VALORISATION
OF OLIVE MILL WASTEWATER

Newsletter #2/2013

MEDOLICO Project

The wastewater generated by the extraction of olive oil needs to be disposed efficiently, so as not to be harmful for the environment. Olive mill wastewater (OMW) is mainly non-biodegradable and may exhibit toxic properties due to its high phenolic content.

Adequate processes and technologies need to be put in place to hinder pollution and to improve the sustainability of the operation of the olive mill. These processes need to be efficient, easy, convenient and precursor of new possibilities with respect to the recovered products. Olive millers still do not use innovative methods in the OMW treatment, basically because they are not aware either of the threats to local environment or the benefits they may get from an efficient usage of the by-products, in terms of new market possibilities (energy market, cosmetics, phytotherapy, nutraceuticals, etc.).

MEDOLICO partners



- 1 Project Coordinator: University of Cyprus - NIREAS IWRC
- 2 Ben Gurion University Israel
- 3 Matimop Israel
- 4 Unioncamere Liguria Italy
- 5 University of Genova Italy
- 6 Jordan University of Science and Technology Jordan
- 7 National Laboratory for Energy and Geology Portugal

The aim of the MEDOLICO Project is to inform olive millers of the environmental risk their activity generates and to provide them with innovative solutions to valorize OMW.

Along its three years' time duration, MEDOLICO works on the following main strands:

- 1) the compilation of the legislation in force and of the technologies available for the OMW treatment and valorization;
- 2) on-site pilot demonstrations to test/compare different processes;
- 3) evaluation of actual use of recovered water for irrigation;
- 4) feasibility and evaluation of OMW by-products recovery;
- 5) economic evaluation of the proposed solutions for OMW treatment and usage.

MEDOLICO's Preliminary Experimental Activities

Partners have recently completed the study "Comparison of OMW screening procedures and technological protocols - bench scale experiments". Screening refers to the comparative evaluation of the performance of different treatment technologies.

The study is structured along three main pillars:

1. Harmonization of OMW screening procedures and technological protocols - bench-scale experiments
2. OMW screening
3. Analysis of OMW screening tests

The main findings are as follows:

1. Harmonization of OMW screening procedures, and technological protocols - bench-scale experiments

The harmonization of the OMW screening procedures and the characterization methodologies for the determination of water quality parameters is a very important task to properly define an experimental work schedule for each OMW treatment technology and to obtain a comparative evaluation of the performances of the tested technologies in OMW treatment application.

The development of technical protocols is a task undertaken by each project partner involved in the OMW treatment tests. The protocols include:

- Description of each tested OMW treatment technology.
- Specifications of the test equipment and the test volume for each tested OMW treatment technology that is examined.
- Specifications of the test procedure for each OMW treatment technology examined.
- Specification of the methodologies for the assessment of parameters which need to be evaluated for each tested OMW treatment technology.

- Timeframe for experimental/demonstrative activity of each project's partner involved in OMW treatment tests.

2. OMW evaluation of the efficiency of various treatment methods

The screening activity for the OMW treatment was performed by the project partners involved in the experimental tasks with the aim to define the optimum experimental conditions for each treatment process. During this task, OMW samples were analyzed prior and after each treatment.

Screening tests of the OMW treatment process have been carried out with the support of the following technologies:

- a) **Nireas-IWRC, UCY**: coagulation/flocculation combined with advanced photocatalytic oxidation technology (solar photo-Fenton).
- b) **LNEG**: Jet-Loop type Reactor (JACTO reactor) technology.
- c) **UNIGE**: integrated membrane processes Microfiltration/Reverse Osmosis (MF/RO).
- d) **BGU**: recovery of polyphenols by Microfiltration and Nanofiltration (MF/NF).

During this period volumes of treated OMW were sent to JUST laboratories in order to run a greenhouse where the potential negative effects on crops irrigated with treated OMW will be tested. Meanwhile, training activities with the aim to transfer the main aspects and knowledge of each treatment technology applied within the MEDOLICO project, to other project partners are in progress.

3. Analysis of OMW screening tests

This part deals with the analytical procedures and methods used for the characterization of raw and treated OMW. Special attention has been paid towards qualitative and quantitative evaluation of polyphenols in the various stream arising from different treatment processes.

The total phenolic compounds (TPh) content was determined by the Folin-Ciocalteu spectrophotometric method (TPh is expressed in terms of milligrams of gallic acid equivalent). Although this method is widely used due to its simplicity, it cannot provide accurate results, since it is also affected by the OMW matrix.

A more accurate procedure based on reversed-phase liquid chromatography, was developed by BGU to identify the major phenolic compounds contained in OMWW samples.

The load in TPh was evaluated for a number of samples of varying origin.

Regarding the main results achieved so far, it seems that a high organic content removal can be achieved during the application of solar photo-Fenton and membrane treatment, thus contributing to the depuration of OMW. The biological treatment through the operation of the JACTO reactor

was found to be less effective in removing the organic content compared to the other processes. Moreover, a successful analysis and recovery of polyphenols was held.

Details related to the aforementioned activities are available on the MEDOLICO Project website: www.medolico.com

MEDOLICO News

- ✦ On October 29th 2013 two project partners, Prof. Munir Rusan from the Jordan University of Science and Technology and Mr. Toumazi Toumazis from Nireas–IWRC – University of Cyprus, participated to the ENPI CBC MED Programme “Capitalisation event”, held in Amman, Jordan. The main topic was “Environmental Challenges” and three cluster groups discussed about: water management, waste treatment and recycling and renewable energy.
- ✦ The EC Commissioner for Enlargement and European Neighbourhood Policy, Štefan FÜLE, in his message at the second annual “European Cooperation Day” mentioned the MEDOLICO Project as a valuable example of shared actions to contribute to environmental protection in the Mediterranean area. You can watch Mr. FÜLE’s video message on our [Project Facebook page!](#)
- ✦ On July 3rd 2013 Unioncamere Liguria, with the support of Università di Genova and Regione Liguria, organized the **first transnational Workshop of MEDOLICO Project in Italy**. The event featured many interesting interventions both from project partners and from public and private stakeholders and was moderated by ENPI CBC MED JTS Officer, Ms. Silvia Fracchia.



Please find below the main issues discussed:

1. MEDOLICO actions



As illustrated by the Project Coordinator – Dr. Despo Fatta–Kassinou, Nireas–IWRC of the University of Cyprus – through cross–border exchange of OMW samples and bench–scale tests, partners have already evaluated the performance of several technologies and developed uniform treatment procedures for each of the processes examined.

Pilot–testing studies are already on–going to make sure, not only that MEDOLICO solutions produce environmentally–friendly OMW, but also that they remain practical for the olive millers implementing them.

Partners are scouting the commercial opportunities offered by some of the OMW components (phenols especially) as by–products for other industries (e.g. cosmetics, food). They are also engaged in the economic evaluation of existing OMW processes and of OMW processes tested in the project, to provide concrete figures to project main target group (olive millers) willing to implement one of these.

2. Best practices in OMW treatment and valorization

The event offered the opportunity to some regional actors involved in other EU funded projects (like RES MAR, Acquaknight) to present their activities to the participants and to illustrate the best practices used by their projects in the OMW treatment and valorization.

It is worth mentioning that the “Ligurian Association of Olive Millers” and the “Tavian Olive Mill”, have both started a process based on reverse osmosis (developed by University of Genova and industrialized by ERDE srl.), to achieve pure water out of the olive oil production cycle.

3. Market Opportunities for OMW technologies

As witnessed by the Director of the Zooprohylactic Institute in Genova, Mr. Angelo Ferrari, there is a growing attention to the stress level in cattle and to its consequences on tissues and organs. Therefore, a collaboration is starting between the Institute and MEDOLICO Project partnership to:

- test the possibility to use OMW in cattle feed;
- verify the effective activity in vivo of OMW;
- evaluate the global cattle welfare status by studying oxidative stress.

Representatives of Italian Chambers of Commerce in Greece (Athens and Thessaloniki) have invited MEDOLICO partners to start a collaboration in order to check business opportunities in Greece for the processes and technologies being tested during the project implementation period.

All presentations are available on the MEDOLICO Project website: www.medolico.com - under “Activities” section.

✦ MEDOLICO project mentioned in “EU neighborhood Info Centre” website:

<http://www.enpicbcmmed.eu/communication/turning-olive-oil-waste-euros-while-protecting-nature-feature-medolico>

Other Projects

In this section we provide information on other EU supported projects focusing on identifying sustainable solutions for water usages and consumption.

ENPI CBC MED Programme – Priority 2

Measure 2.1 – Prevention and reduction of risk factors for the environment and enhancement of natural common heritage

AQUAKNIGHT Project – Mediterranean water resources are extremely under stress, especially in the south and east shore. In Jordan, Lebanon and Tunisia, water demand constantly increases, while water use efficiency can still be considered as limited. These are the two most critical factors regarding the sustainability of the most elementary earth resource: water.

Under this concept, policies aiming at improving usage efficiency and at reduced losses and poor usage, are urgently needed. In this sense, AQUAKNIGHT project focuses on optimizing

consumption and minimizing the Non–Revenue Water (water not metered or billed to consumers) through the implementation of five pilot projects in the cities of Limassol (Cyprus), Genoa (Italy), Alexandria (Egypt), Tunis (Tunisia) and Aqaba (Jordan).

For more information visit the website: www.aquaknight.eu

SWMED Project – The whole Mediterranean area is characterized by a strong need of new solutions able to provide and sanitations services while reducing water use and wastewater discharge. The SWMED project focuses on the optimisation of the per capita water consumption at household and urban level through the implementation of water saving devices, reuse of treated wastewater, rainwater harvesting, a pool of technologies known as Sustainable Water Management (SWM).

For more information visit the website: www.swmed.eu

NANOWAT Project – Most of the Mediterranean countries suffer from water shortage due to both increasing demand and declining water quality. Rivers, lakes, groundwater resources and the sea have become more and more polluted by agrochemicals and other potentially toxic substances resulting from intense agricultural and industrial activities. Besides the necessary efforts to be undertaken to reduce water consumption, such a situation calls for innovative and cost–efficient solutions to purify contaminated water and recycle wastewater.

NANOWAT project focuses on the experimentation, development and diffusion in the Mediterranean area of new technologies for efficient water treatment based on natural and modified nano–materials, using either filtration and sedimentation, photo–degradation, or their combination. The application of nanotechnologies in the field of water treatment has the potential to offer low–cost and transportable solutions in areas where it is difficult or too expensive to implement large scale water purification plants.

For more information visit the website: www.nanowat.eu

“Promoting sustainable groundwater resources in the Mediterranean Basin” Project – Groundwater is the world's most important source of freshwater, constituting 97% of the earth's freshwater reserves. In many parts of the Mediterranean region, this resource is increasingly being polluted by human activities. Given the large role local authorities play in overseeing industrial and other polluting activities in their jurisdictions, these actors can considerably improve efforts to protect shared groundwater resources.

This project aims to empowering a selection of Mediterranean municipalities with the technical and administrative skills to alleviate sources of groundwater pollution in their jurisdiction as well as enhancing cooperation across Mediterranean Basin municipalities to protect common natural heritage.

LIFE + Programme – Environment Policy and Government

The 'aWARE' project aims to promote the re–use of reclaimed water within water management organizations. To this end, the project hopes to demonstrate the technical feasibility and economic and environmental advantages of two different technologies as advanced treatments for wastewater and reclamation facilities. The project proposes an innovative hybrid process using membrane bioreactors (MBR), powdered activated carbon (PAC) and nanofiltration (NF) to enable re–use of wastewater. It will experiment with MBR–PAC–NF configurations – including PAC dosage and cleaning conditions – to optimize their efficiency and reliability. It hopes to demonstrate the feasibility of such a process in removing contaminants, define the optimal operation for each

configuration and identify risk assessment factors. The project will evaluate the energy and reagents consumption, as well as sludge and footprint minimization of the systems. It will carry out lifecycle assessment (LCA) and cost/benefit analysis (CBA) for the environmental and economic impact of the proposed configurations to enable comparison with existing advanced treatments. Through the development of these novel approaches, the project also hopes to improve the operational flexibility and reduce the fouling effects of other reclamation processes, such as hybrid ultra-filtration and reverse-osmosis (UF-RO) systems. By consolidating knowledge about water reclamation technologies and promoting water re-use initiatives among water management bodies, the project hopes to enable both implementation of existing EU environmental policy and further legislation in the re-use of wastewater. It ultimately seeks to contribute to a considerable water re-use scheme at EU level.

Territorial Cross-Border Cooperation Programme “France-Italy Maritime”

“RES-MAR – Réseau pour l’environnement dans l’espace Maritime” covers the geographical area of the Upper Tirreno Sea Basin and it involves French and Italian regions.

Its main focus is on the identification of best practices in the field of land and water environmental protection. It is then structured along three main pillars:

- water resources management;
- coastal erosion and coastal dynamics;
- territorial governance.

Within the third pillar, a particular attention has been given to agriculture and olive oil production in the given area of a Ligurian Natural Parc (Parco di Montemarcello – SP), to identify new ways to reduce footprints of cultivating olives and produce olive oil.

To this extent the following actions have been carried out:

- olive oil life-cycle analysis;
- SWOT analysis together with potential corrective actions
- production of the Chart for a Sustainable Olive Oil production in the area of Parco Montemarcello Magra
- check of the environmental compliance level.

Results so far achieved are in line with MEDOLICO Project challenges and objectives:

- only a limited number of olive millers is aware of legislation in force with respect to OMW treatment;
- therefore, a limited number of olive millers requires a chemical analysis of the OMW before lagooning or discharge;
- olive millers generally underestimate the potentials of OMW contents.

PROJECT COORDINATOR:



PROJECT PARTNERS:

