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CROSS-BORDER COOPERATION IN THE MEDITERRANEAN

Mediterranean Cooperation in the Treatment and Valorisation of Olive Mill Wastewater (OMW)

MEDOLICO

Deliverable 2 – Executive Summary

Activity 5: Comparison of OMW screening procedures and technological protocols – bench scale experiments

- **Activity 5.1** Harmonization of OMW screening procedures and technological protocols – bench scale experiments
- **Activity 5.2** OMW screening
- **Activity 5.3** Analysis of OMW screening tests



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Executive summary

Activity 5: Comparison of OMW screening procedures and technological protocols – bench scale experiments

Activity 5.1 Harmonization of OMW screening procedures and technological protocols – bench scale experiments

Activity 5.2 OMW screening

Activity 5.3 Analysis of OMW screening tests

The deliverable should be regrouped into two main aspects:

- chronology of activities
- analysis of the results and comparative observations and deductions on the proposed processes.

First of all it is worth noticing the relevant activity of all partners and their important contributions to this task. All activities were conducted regularly without problems or difficulties except some hitches connected to the transportation and delivery of samples between the different partner and the huge difficulty encountered by Jordanian partner in the acquisition of the demonstration plant. However such problems are now completely outdated and will not further affect both activity or objective of the MEDOLICO project.

The main results achieved are presented in detail in the individual tasks (5.1, 5.2 and 5.3) of Deliverable 2; this executive summary highlights and comments the main topics.

The report of activity 5.1 deals with the protocols aimed to define detailed procedures and methods for each specific measurement and/or experiment with particular reference to the analytical methods adopted for a proper characterization of raw and treated OMW. The discussion of these protocols was preliminarily made during the first kick-off meeting of the project held in Cyprus in 2011, then



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completed in occasion of the a meeting held in June 2012 in Lisbon, after continuous interaction and information exchange via phone and e-mail between various partners.

In this deliverable experimental conditions and operating mode for each partner have been set and shared. Since three oleic campaigns have to be covered, each partner must carry on his tests considering the possibility of activities integrations and the project timetable. Moreover, because of the difficult handling and shipping of typically unstable OMW in large volumes, the number and the minimum volume of various samples that have to be sent among partners to match project tasks has been established. In detail, samples shipping specific mode definition was not correctly estimated in the original project version. For this action was not stated any budget, and various problems arose for custom release among different countries, concerning the type of sample: the only way to overcome these problems is to name the waste as analytical sample or deperated water for irrigation tests. Now all the difficulties have been solved and the activity is in progress.

The report of activity 5.2 deals with the screening tests of the OMW treatment process and in particular:

- a) From UCY – solar-Fenton photocatalytic oxidation technology.
- b) From LNEG – Jet-Loop type Reactor (JACTO reactor) technology.
- c) From UNIGE – integrated membrane processes MF/RO.
- d) From BGU – polyphenols analyses and recovery. Microfiltration and nanofiltration: working conditions, performance of microfiltration and nanofiltration membranes and analytical results of the various liquid streams obtained.
- e) Activity of JUST – pilot tests with JACTO reactor and greenhouse phytotoxicity tests.

During this period large amount of treated OMW was sent to Jordan labs in order to test its reuse in agriculture. The experiments on the pilot plant delivered at the end of the 2012/2013 campaign will start at the beginning of the next campaign 2013/2014. Meanwhile start-up and test and training activity necessary for the management of the successive planned experiments are in progress. In



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particular all the JUST activity connected to the use of the JACTO pilot plant as well as the green house experiments are planned in the next WP and will be reported in the Deliverable 3.

The report of activity 5.3 describes 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 membrane processes (MF, UF, NF, RO) treatment. An important aspect in polyphenols analysis deals with the reliability of spectrophotometric methods for the quantitative evaluation of the so-called total polyphenols (usually expressed in terms of amount of Gallic or Caffeic acid for liters of analysed solution). These methods are broadly used since they are very simple but in some occasions they can lead to poor accurate or unreliable results, since they are also affected by the original matrix of compounds.

A more accurate procedure is based on the liquid chromatography, studied and refined by BGU-IL group, in order to obtain also a very precise identification of each type of polyphenols.

Different results were obtained depending on the place (country, region) of origin of the wastewater but, above all, on the olive oil production technology (including the amount of water used to treat a given amount of fruit) and the storage (or aging) time of the OMW before treatment.

The main characterization parameters taken into consideration to evaluate the effectiveness of a given treatment process were: conductivity, Total suspended solid (TSS), Chemical oxygen demand (COD) and total polyphenols (TP). Identification of various polyphenols and evaluation of their content were also important parameters to be considered for a proper characterization of the liquid streams obtained from various treatment processes.