CHARACTERISTIC OF WASTES GENERATED IN OLIVE OIL MILLS

- **By-products and wastes generated in the three-phase system (Roig et al., 2006; Borja et al., 2006)**
  - **Olive husk (also called olive pomace, olive cake, and "orujo"):**
    This waste had a second oil extraction with organic solvents after its drying. In this form is obtained other oil with a lower quality called olive cake oil
  - **Olive mill wastewaters (also called "alpechín"):**
    They are constituted by vegetable water of the fruit and the water used in different stages of oil extraction. The principal characteristic of OMWW is the presence of organic compounds such as organic acids, lipids, alcohols and polyphenols that turn OMWW into phytotoxic materials, representing a great environmental hazard. According to Borja et al., 2006 this OMWW is characterised by:
    - Violet-dark brown to black color
    - Strong olive oil smell
    - High degree of organic pollution (COD values up to 220 g/l)
    - pH between 4 and 6
    - High electrical conductivity
    - High content of polyphenols (O.5-24 g/l)
    - High content of solid matter.

Maximum and minimum values of the main contamination-related parameters of three-phase OMWW.

Parameter	Units	Maximum	Minimum
pH		6,7	4
Redox potential	mV	-330	-80
Conductivity	mS/cm	16	8
Density	g/L	1,1	1,02
Suspended solids	g/L	9	1
Settleabe solids	ml/l h	250	10
Biochemical oxygen demand, BOD_5	mg/l	110000	35000
Chemical oxygen demand, COD	mg/l	178000	45000

Maximum and minimum values of the principal chemical characteristics of OMWW.

Parameter	Units	Maximum	Minimum
Dry matter	%	7,1	6,33
Organic matter	g/l	62,1	46,5
TOC	g/l	39,8	34,2
TN	g/l	2,1	0,62
P_2O_5	g/l	0,7	0,31
K_2O	g/l	10,8	2,37
Na	g/l	0,42	0,11
Ca	g/l	0,64	0,2
Mg	mg/l	220	44
Fe	mg/l	120	18,3
Cu	mg/l	6	1,5
Mn	mg/l	12	1,1
Zn	mg/l	12	2,4
Lipids	g/l	12,2	1,64
Poliphenols	g/l	10,7	0,98
Carbohydrates	g/l	16,1	1,4

- **Wastes generated in the two-phases olive oil**
  - **Two-phase olive mill waste, TPOMW** (also called "alpeorujo", olive wet husk, olive wet pomace or olive wet cake) is a semisolid (sludge form) waste with a strong odour and a doughty texture.. The water content of this waste is about 55-70% while the moisture of three-phase olive cake is around 40-45%. For this fact the industrial recovery of oil from TPOMW is difficult and expensive.
  - **Olive vegetation waters and process wastewater** are included in TPOMW
  - **Other solid by-products (leaves, small twigs and stones or pits)** are used as a caloric source, animal feed and for obtaining antioxidant compounds.

Maximum and minimum values of the principal chemical characteristics of TPOMW.

Parameter	Units	Maximum	Minimum
pH		6,8	4,9
EC	dS/m	5,24	1,2 (me parece demasiado bajo)
OM	%	98,5	60,3
C/N		59,7	29,3
TN	g/kg	18,5	9,7
P	g/kg	1,5	0,3
K	g/kg	29	6,3
Ca	g/kg	12	2,3
Mg	g/kg	1,7	0,5
Na	g/kg	1	0,8
Fe	mg/kg	2600	1030
Cu	mg/kg	138	13
Mn	mg/kg	67	13
Zn	mg/kg	27	10
Lignine	%	47,5	19,8
Hemicellulose	%	38,7	15,3
Cellulose	%	33,7	17,3
Lipids	%	18	3,76
Proteins	%	7,2	6,7
Carbohydrates	%	19,3	9,6
Phenols	%	2,4	0,5

References

Roig, A., Cayuela, M.L. and Sánche-Monedero, M.A. 2006. An overview on olive mill wastes and their valorisation methods. Waste Management 26: 960-969.

Borja, R., Raposo, F., Rincon, B., 2006. Treatment technologies of liquid and solid wastes from two-phase olive oil mills. *Grasas Y Aceites*, 57, 32-46.