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LIFE MULTIBIOSOL



New Tannery Chemicals from Olive Mill Wastewater

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TANN  W

 NCIAVO

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Le ali alle tue idee

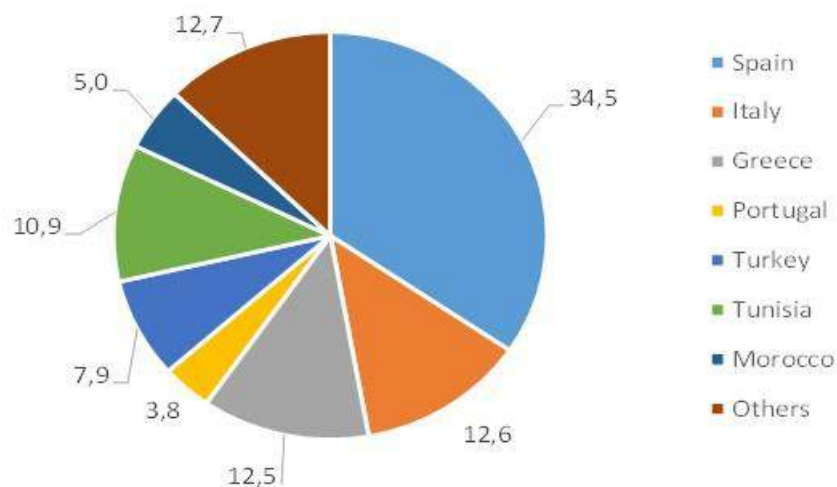
The GOAL: Start-up a business initiative, where Olive Mill Wastewater (OMW), is transformed into tannery chemicals, as an example of circular economy

The INNOVATION PROPOSED: Reuse of OMW to produce innovative Cr-free leather articles and CrVI-free Cr-tanned leather articles

The soundness of the business initiative relies on the leading position of Europe and Italy for production of olive oil and leather, thus the availability of OMW shall cover the demand for leather tanning processes

The INDUSTRY NEEDS: Figures of Olive Oil sector

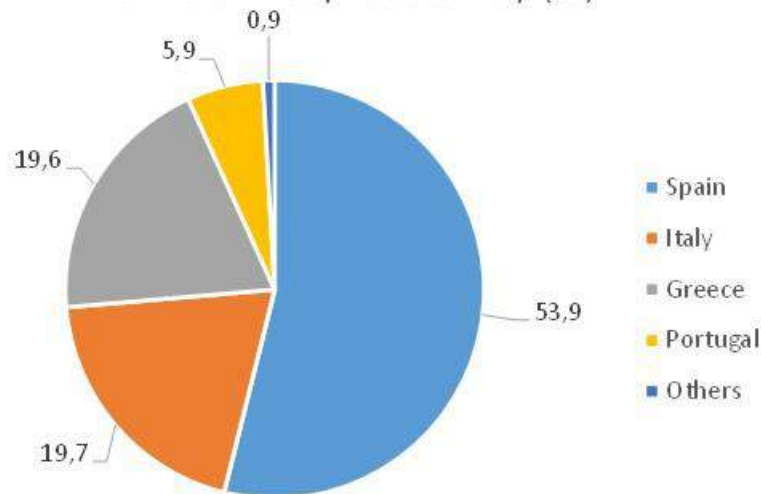
Olive Oil World productivity (%)



Spain and Italy are the main European producers of the Mediterranean area, covering in 2014/2015, respectively of **53.9%** and **19.7%** (825 ktons and 302 ktons)

European olive oil production in the season 2014/2015 with 1.53 million tons, represented **64% of the worldwide production**

Olive Oil EU productivity (%)



The INDUSTRY NEEDS: Figures of Olive Oil sector

OMW is a complex mixture of water, sugars, nitrogenous substances, organic acids, pectins, mucilages and tannins, lipids and inorganic substances, with **poor biodegradability and high phytotoxicity** due to the presence of a large amount of phenolic compounds, free fatty acids and inorganic salts.

The pollutant load of 1 m³ of OMW is equivalent to 100-200 m³ of municipal wastewater.

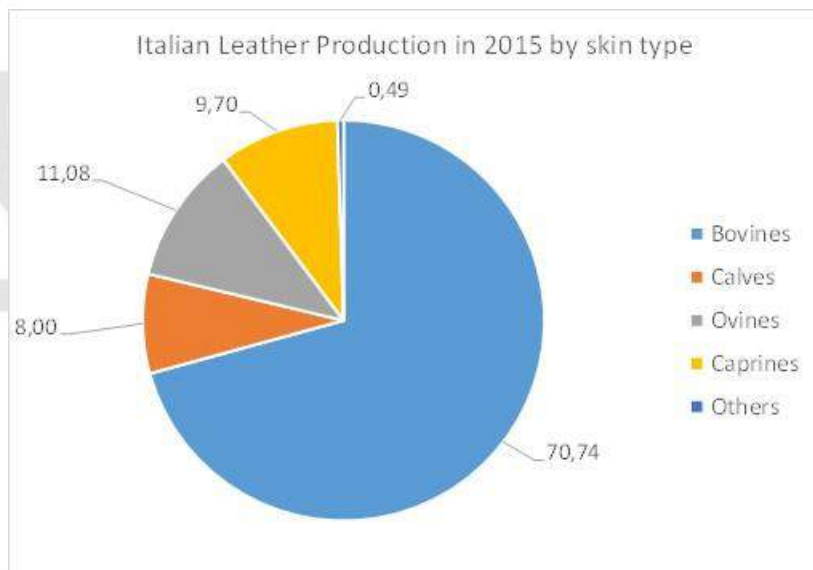
Olive Oil producers send OMW to disposal with an average cost of **25 €/ton**. During milling season, a medium olive oil producer can produce 1000-5000 tons of OMW, meaning a cost (transportation excluded) of **25-125 k€**.

The fate of OMW once collected:

- ✓ *Wastewater treatment plants*
- ✓ *Biogas production*
- ✓ *Agricultural soil spreading*

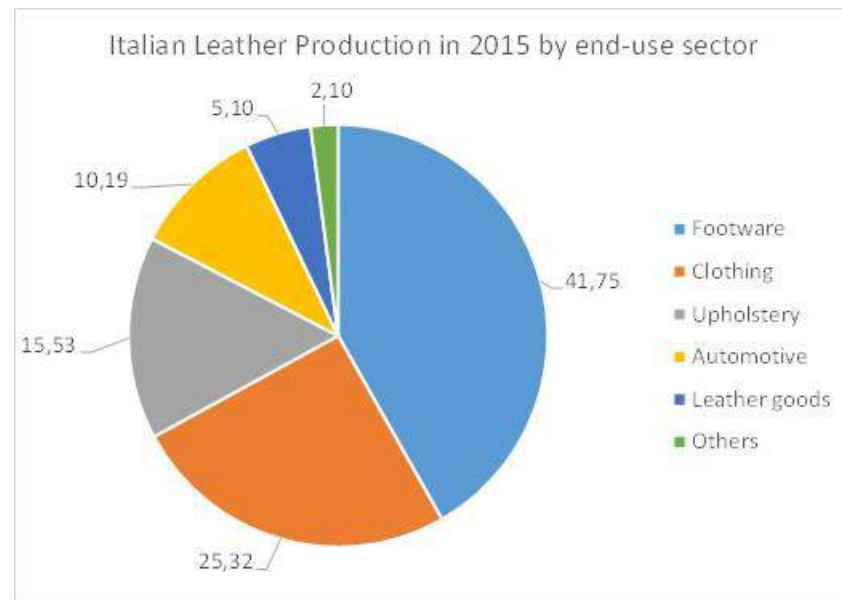


The INDUSTRY NEEDS: Figures of Tannery sector



Italy is the main world and EU leather producer, accounting respectively for 19% and 65% of the total production value (Italian productivity in 2014: 5 bn€, 123 Mm²).

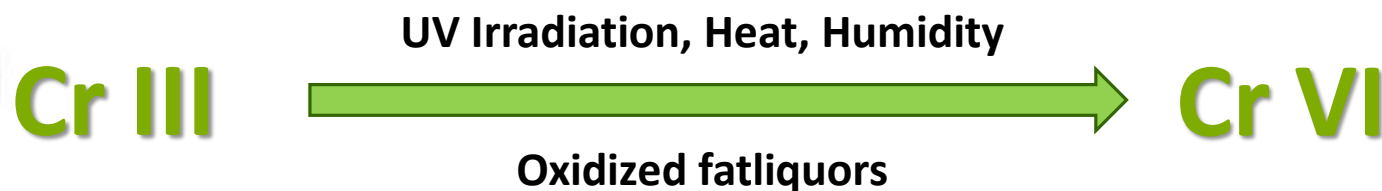
In 2015 Italy produced 25% of the leather exported all over the world and imported 19% (world quote) of raw and semi-finished leather. Leather articles are mainly produced by bovine and calf skin, while the main end-use markets are **footwear, clothing and upholstery**.



The INDUSTRY NEEDS: Figures of Tannery sector

Nearly **80-85% of worldwide leather production** is carried out with Chromium III-containing substances as tanning agents, meaning nearly 772 Mm² (approximately 772 ktons) of leather articles.

Under certain production and storage circumstances Chromium III can transform to carcinogenic Chromium VI.



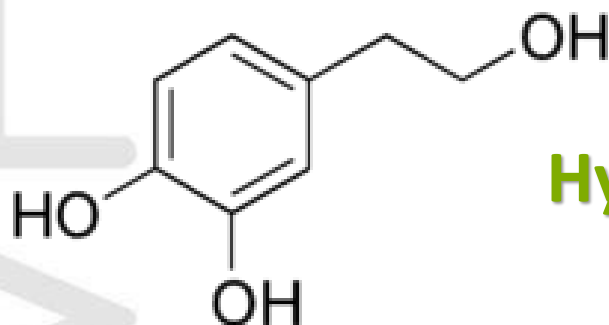
Although on 26 March 2014 the EU published a regulation to ban leather articles for sale if Chromium VI is present in concentrations > 3 mg/kg, there are voluntary actions lead by the **main environmental associations and large fashion groups** who intend to find an ultimate solution to this problem:

Find an alternative and safer way to tan leather without chrome salts by 2020.

The SOLUTIONS

To transform the present limitation of OMW into a competitive advantage, as raw material rich of:

- High molecular weight phenols having **tanning behaviour**
- Low molecular weight phenols having **antioxidant behaviour**



Hydroxy-tyrosol

Antioxidant strength
10 times green tee

2 times CoQ10

The SOLUTION

To develop OMW - derived polymers with tanning and antioxidant behaviour for:

- ✓ Producing **totally Cr-free** tanned leather articles for footwear, clothing and leather goods;
- ✓ Producing **Cr-tanned leather articles** for footwear, clothing and leather goods, with a **high resistance to Cr VI formation**.

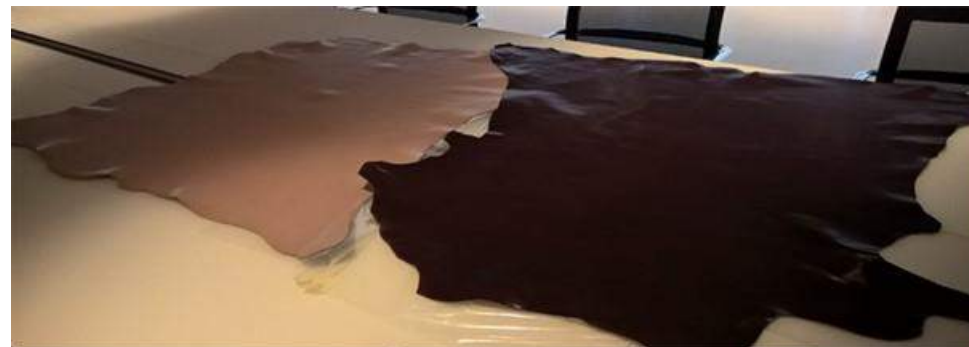
The KNOW-HOW

- Process for the enrichment of Hydroxy-tyrosol into OMW (Pat. Pending)
- Process for producing OMW-derived tanning and antioxidant chemicals (Trade secret)
- Processes and methods for using OMW & OMW-derived chemicals in tannery industry (Pat. Pending)

The PRODUCTS



The PRODUCTS



**Presented in Sept. 2016 at
Internation Fair «Linea Pelle» in
Milan**



The ADVATAGES

- ✓ No need to use sulphuric acid in pickel phase;
- ✓ HYDROIL can be used for tanning for metal-free leather;
- ✓ HYDROIL can be used for retanning to avoid CrVI formation;
- ✓ HYDROIL has also filling behavior;
- ✓ Same properties of Cr-tanned leather

Chemical, physical & mechanical features of Cr-Free leather vs Cr-Tanned leather For footwear end use

Properties	Cr-free Tanned leather	Cr-Tanned Leather
Gelation Temperature UNI EN ISO 3380:15)	84-86 ° C	> 100°C
Color fastness Xeno test (ISO 105 B02:14)	4-5 grey scale/48h	4 grey scale/48h
Color fastness to dry rubbing (UNI EN ISO 11640 & 11641)	4-5 grey scale/100 cy	4-5 grey scale/100 cy
Color fastness to wet rubbing (UNI EN ISO 11640 & 11641)	4 grey scale/20 cy	4 grey scale/20 cy
Ball burst method (ISO 3379:15)	316 N, 8,9 mm elong.	278 N, 8,3 mm elong.
Determination of tear load (UNI EN ISO 3377-2)	83,36 N	73,95 N
Total Cr, Al, Ti, Zr, Fe (UNI EN ISO 17072_2:11)	< 1000 mg/kg	-

Cr VI formation resistance in OMW-derived retanning of Cr-Tanned Leather

TEST 1: Realistic conditions

- ✓ Cr-Free Retanning on Wet Blue Leather
- ✓ Fatliquoring mixture: 95% Std + 5% peroxidized (424 mg O₂/kg)
- ✓ Retanning agents: OMW-derived resin vs Standard resin

Parameters	Method	OMW-resin	Std-resin	Limit
Cr VI	UNI EN ISO 17075:08	2,16	3,73	≤ 3 mg/kg
Cr VI after ageing (24 h 60° C, <20% RH)	UNI EN ISO 17075:08	2,21	4,14	≤ 3 mg/kg

TEST 2: Stressed conditions

- ✓ Cr-Free Retanning on Wet Blue Leather
- ✓ Fatliquoring mixture: 80% Std + 20% peroxidized (424 mg O₂/kg)
- ✓ Retanning agents: OMW-derived resin vs Standard resin

Parameters	Method	OMW-resin	Std-resin	Limit
Cr VI	UNI EN ISO 17075:08	12,32	31,36	≤ 3 mg/kg
Cr VI after ageing (24 h 60° C, <20% RH)	UNI EN ISO 17075:08	20,83	34,11	≤ 3 mg/kg

FUTURE GOALS

DEVELOP OTHER BIOBASED TANNERY CHEMICALS:

- ✓ **BIODEGRADABLE SURFACTANTS**
- ✓ **BIOPRESERVATIVES**
- ✓ **TANNING ALDEHYDES**

**THANK YOU VERY MUCH FOR YOUR KIND
ATTENTION**

QUESTIONS?

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