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Giovedì 19 settembre 2019, REMTECH Ferrara

REMTECH EXPO

REMTECH

Ceppi fungini autoctoni per la degradazione di ETBE in acqua di falda di un punto vendita carburante

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REMTECH EXPO

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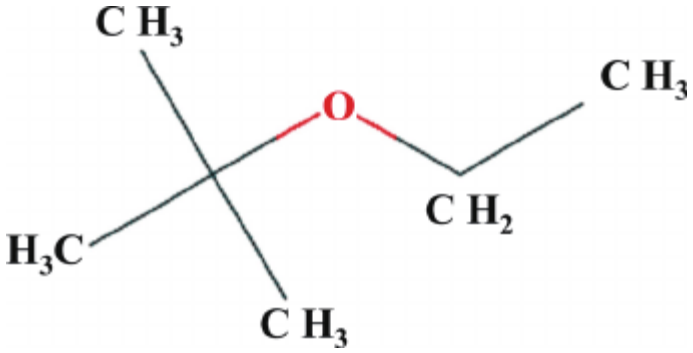
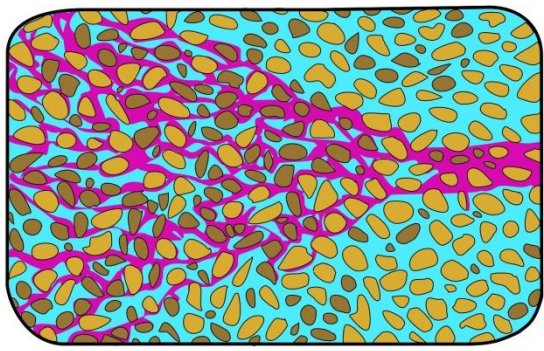


Ethyl Tertiary Butyl Ether (**ETBE**) is produced from ethanol and isobutylene in a catalytic reaction. Blending with ETBE, improves the combustion characteristics of petrol, and ETBE is also more compatible with pipelines and engines than ethanol.

ETBE is produced from bioethanol (Bio-ETBE). Isobutylene is currently derived from fossil sources from either refining or from natural gas. ETBE provides improvements in air quality when blended into conventional gasoline. The EU maximum blending level specification for ETBE is 22% in E10 gasoline and 17.24% mass in E5 (equivalent to 2.7% mass of oxygen).



The extensive use of this soil conditioner and its high solubility in a watery environment make it a very common contaminant in underground aquifers. The D.M. n.31 / 2015 establishes the limit for ETBE in groundwater in **40 µg / l**.

In the absence of an active removal process, ETBE may persist in the ecosystem and the drinking or irrigation use of contaminated water causes it to enter the food chain.

WHY FUNGI IN BIOREMEDIATION?

- pioneer organisms
- colonize every kind of environment (desert, deep oceans, hydrothermal vents, Antartide, rocks, mines, polluted environments, ecc.)
- developed specific strategies and tolerance mechanisms against limiting factors (organic acids, enzymes, metabolites, etc.)

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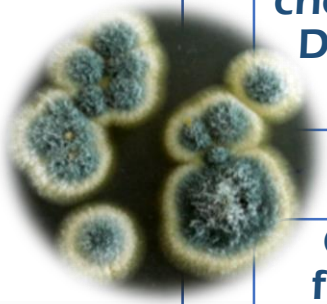
WHAT KIND OF FUNGI?

Macrofungi

Wood-degrading fungi are particularly effective in breaking down aromatic pollutants (toxic components of petroleum) herbicides, pesticides, etc.

Mushrooms can be "trained" to break down TNT, PCBs, Dioxins and other dangerous toxins.

Microfungi



As living filters can capture hazardouys sites runoff, metals and chemicals from Papermills, Dye manufacturers, and Power Plants.

Contaminated brown fields and quarantined mill sites can be bioremediated to breack down complex, carcinogenic compaunds before they leach into the groundwater.

WHAT KIND OF FUNGI?

autochthonous

- adaptation to pollutant toxicity
- adaptation to competition with other microorganisms
- degradation capability is strain-specific rather than specie-specific
- hard work

- well known capability to degrade recalcitrant pollutants
- robust and versatile strains coming from well characterized collections of microorganisms
- often not able to compete with autochthonous microorganisms in non sterile-conditions

allochthonous

AD HOC PROTOCOLS OF MYCOLOGICAL CHARACTERIZATION

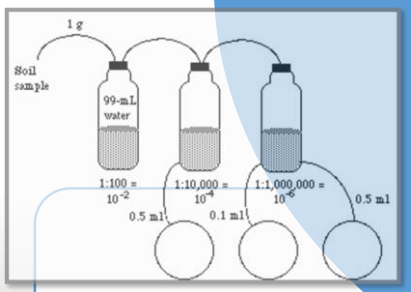
- physico-chemical
- pH
- grain-size
- ecc.

Environmental characterization

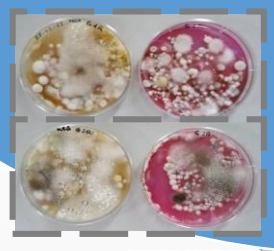
Sampling

- Where
- How
- How many

Selection

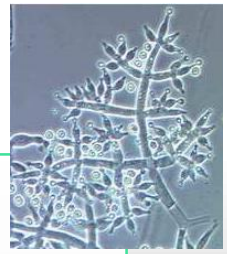


Isolation

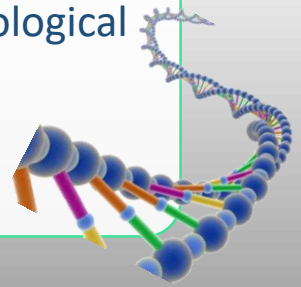


- dilution plate technique
- vital fungal strains

Identification



- morphological
- DNA

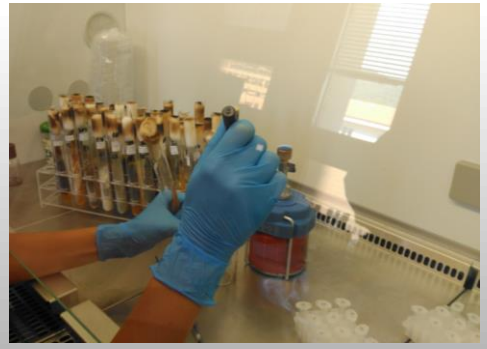


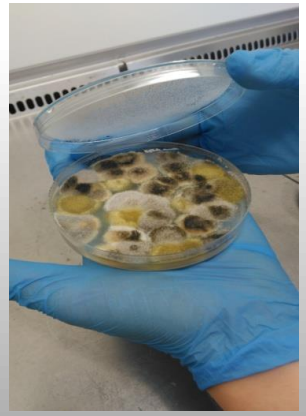
Materials and methods

REDUCE THE VALUE OF ETBE IN GROUNDWATER THANKS TO THE USE OF INDIGENOUS MICRO-FUNGAL STRAINS

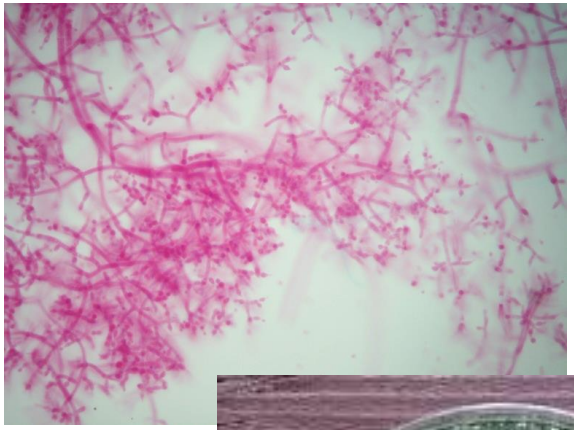
Mycological analysis in the waters aimed at identifying and selecting the best performing autochthonous species and micro-fungi strains.

Fungi selected are re-inoculated in concentrations much higher than those of departure to speed up the degradation and / or absorption of ETBE.



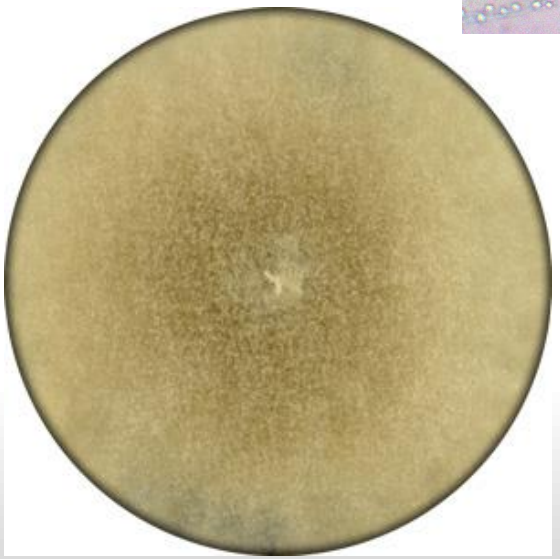


Fungi in ETBE POLLUTED WATER

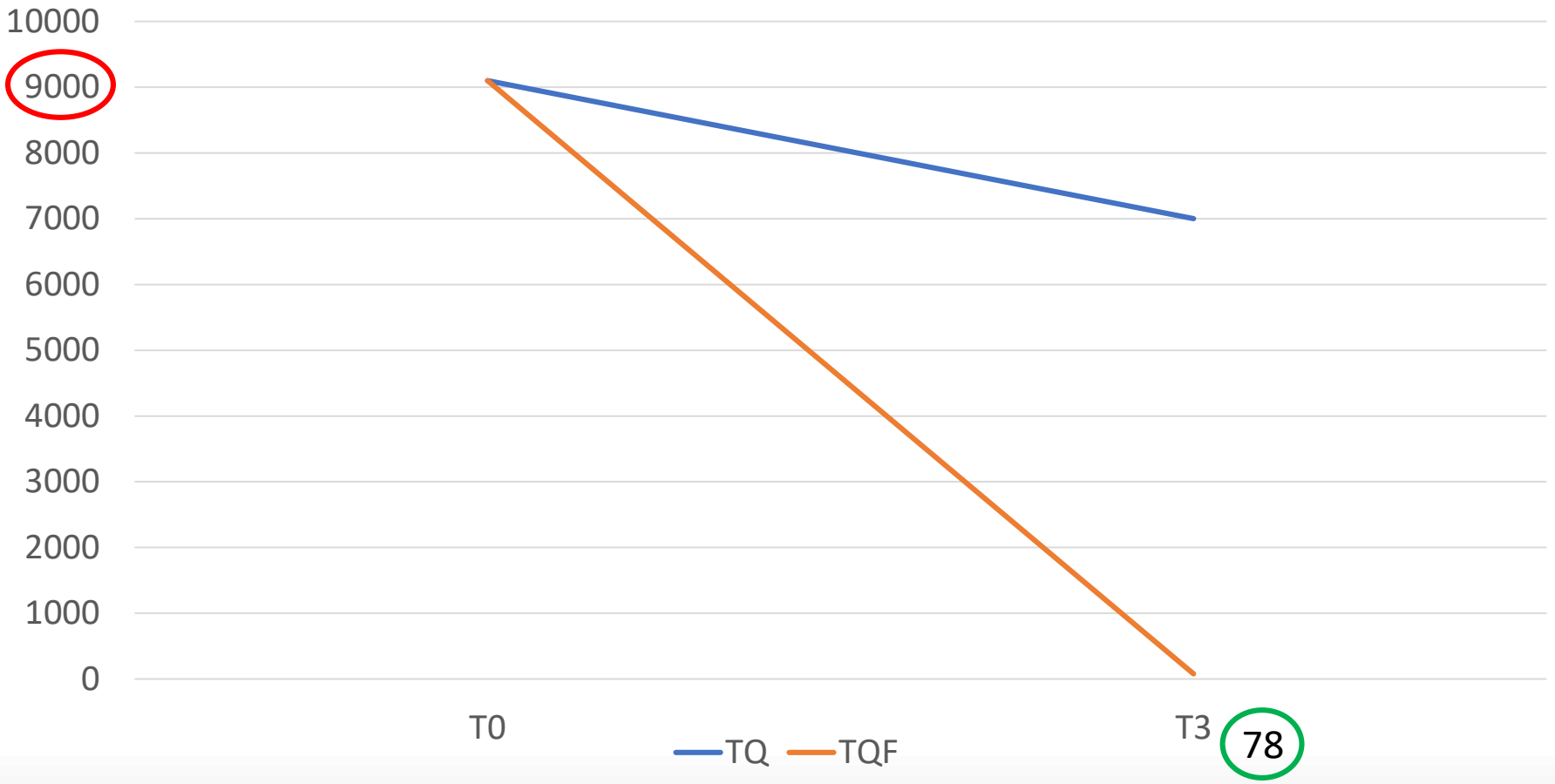


Trichoderma strain

Mucor strain

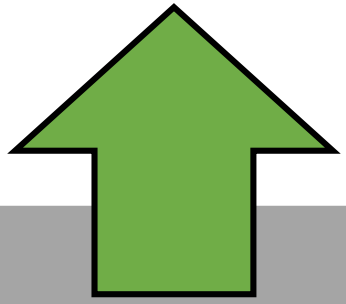


Preliminary results

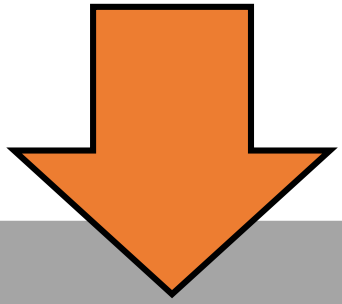


TQ= water contaminatd by ETBE not treated with fungi
TQF= water contaminated by ETBE treated with fungi
T0= initial ETBE concentration in underground water
T3= ETBE level concentration after three months

CONCLUSIONS



- respect of ecosystem
- not introduce alien species
- speed up the biodegradation process of ETBE



- samples treatment
- preliminary results

Further tests and studies are needed

... and follow fungi!