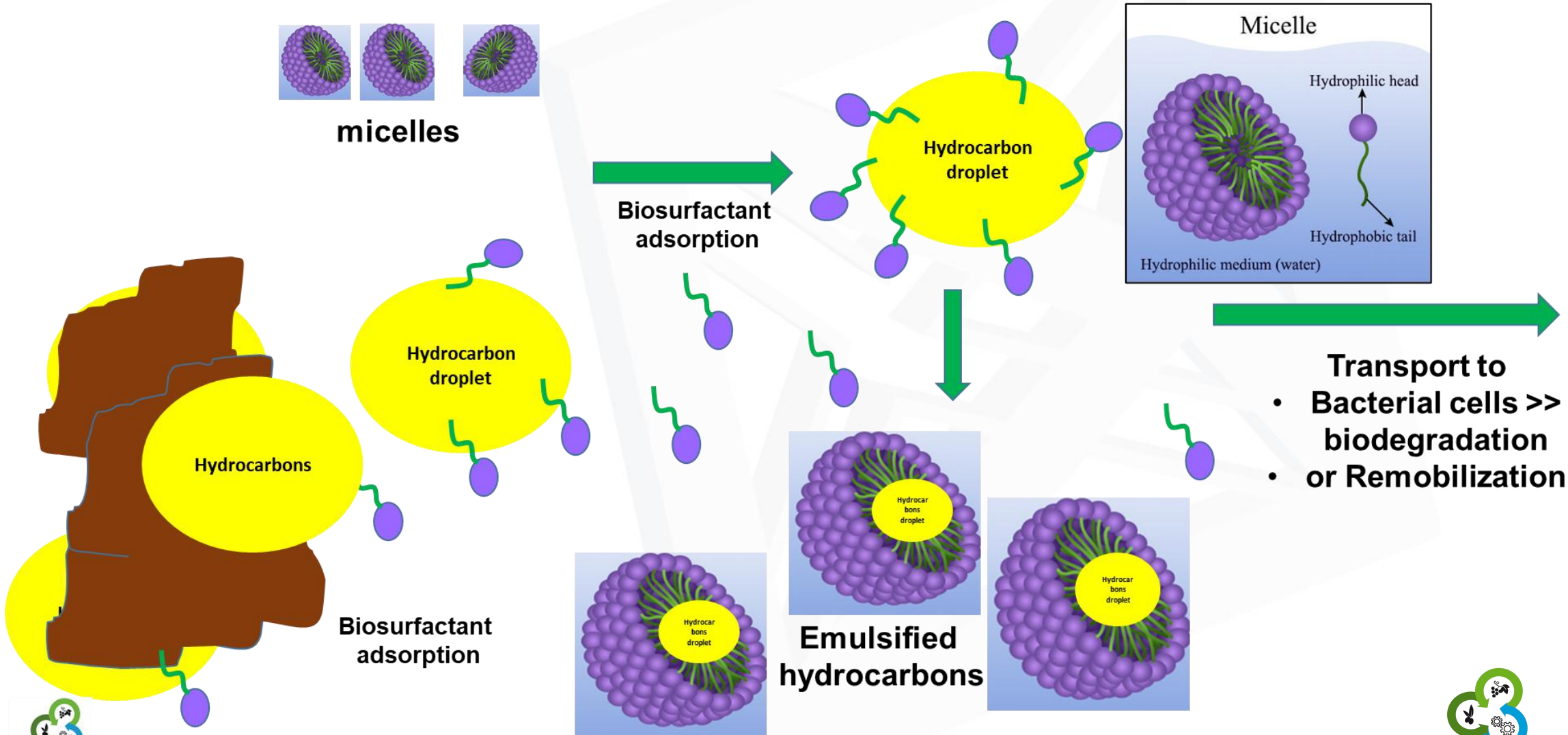
DIPARTIMENTO DI SCIENZE
DELL'AMBIENTE E DELLA TERRA (DISAT)

Trattamento di terreni contaminati da idrocarburi con i biotensioattivi prodotti

MOBILIZZAZIONE DEGLI IDROCARBURI

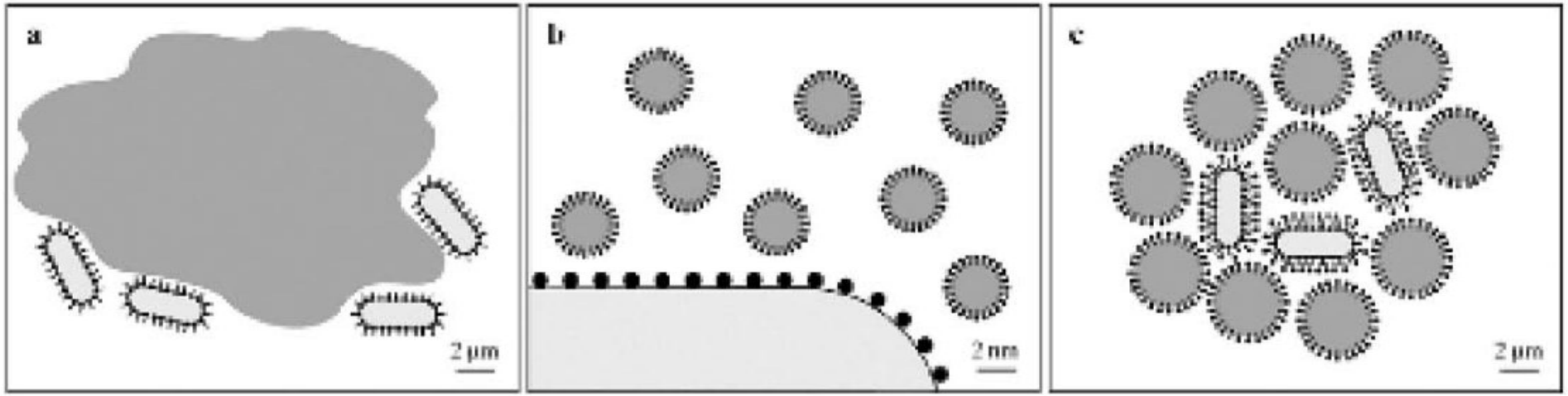


TENSIOATTIVI E BIODEGRADAZIONE DEGLI IDROCARBURI

1. Sostanze solubilizzate

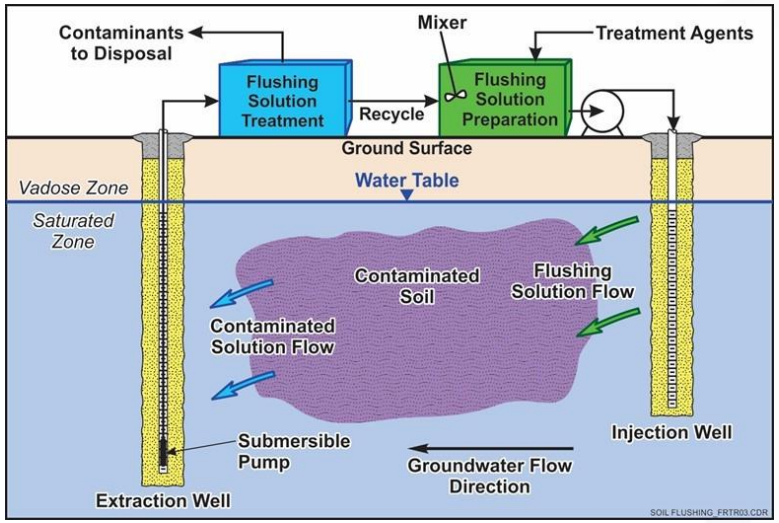
2. Uptake diretto (a)

3. Uptake mediato da biotensioattivi (b, c)

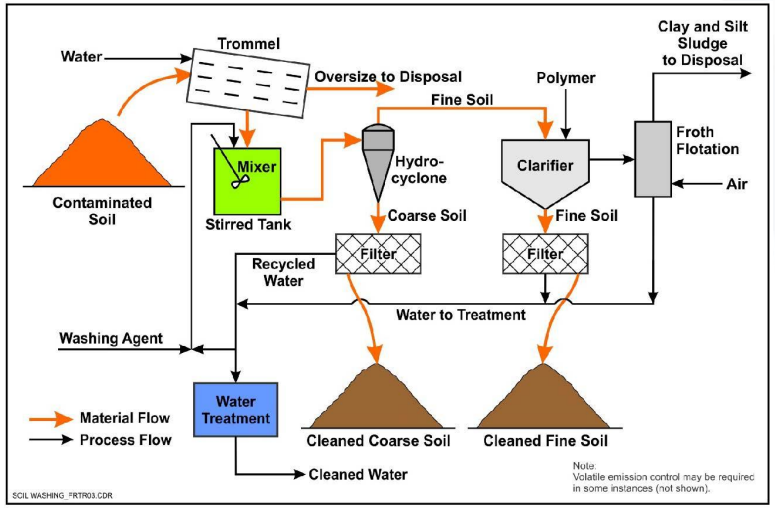


TENSIOATTIVI NEL TRATTAMENTO DI TERRENI CONTAMINATI

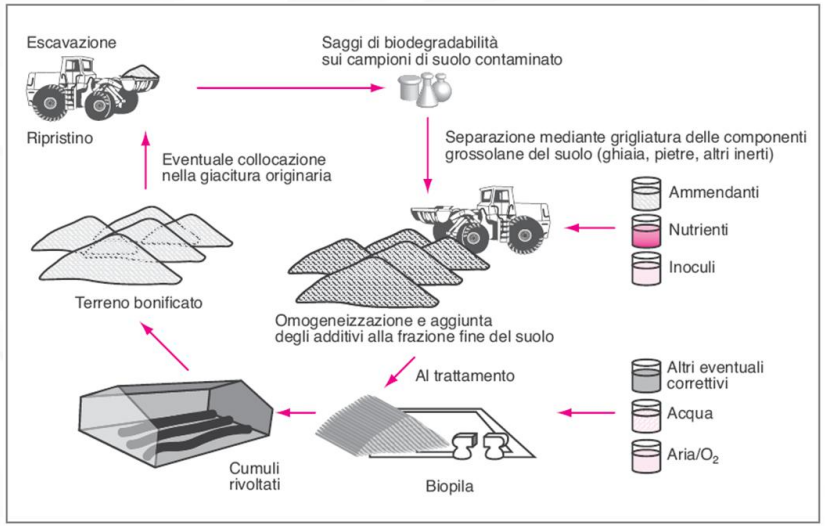
Soil flushing



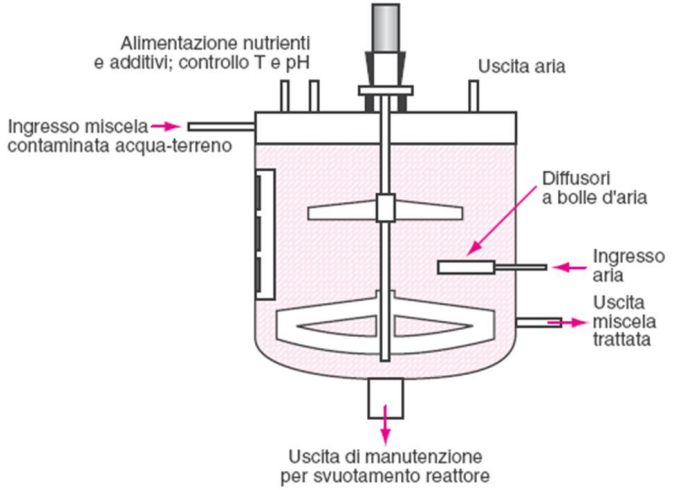
Soil washing



Bipile/Landfarming



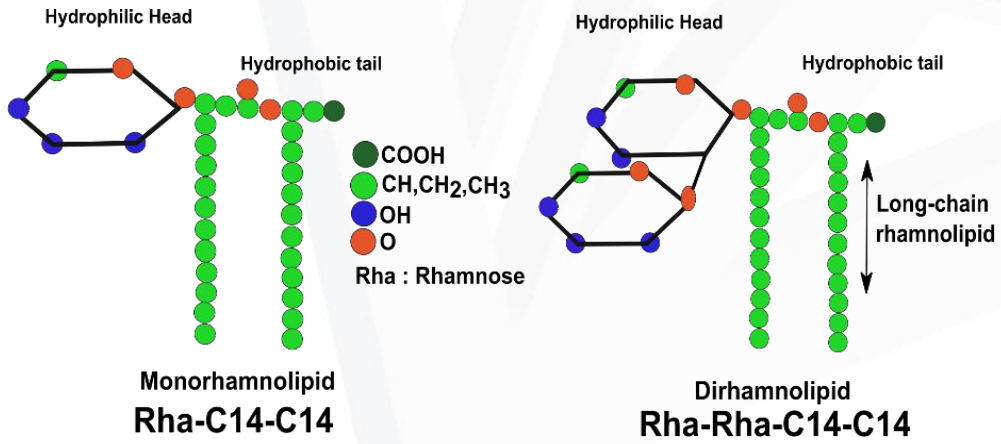
BioSlurry



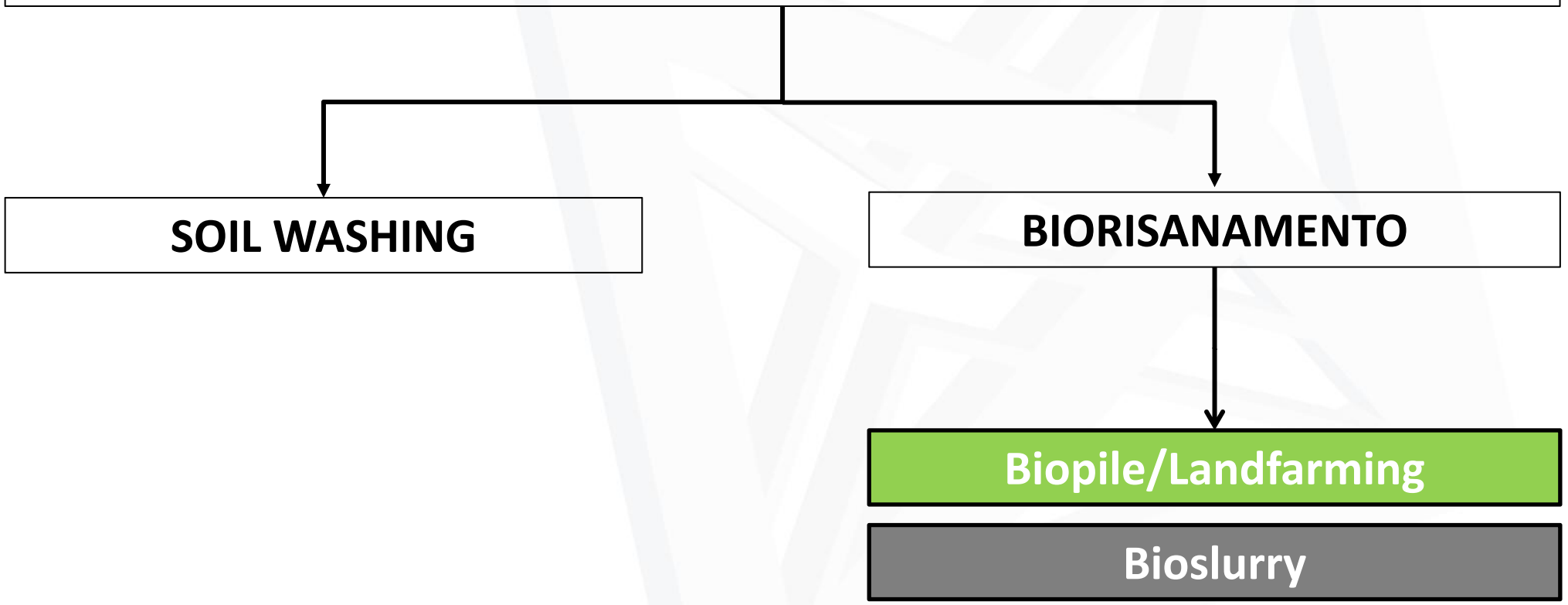
RAMNOLIPIDI DA VINACCIA

Agricultural wastes	Rhamnolipid congener	Pseudomolecular (m/z)	Retention time (min)	Relative abundance (%)
Nonfermented grape marcs (NF)	Rha-C12-C14/Rha-C12-C14	587	10.98	**12.56**
	ND	643	10.9	**2.39**
	Rha-Rha-C12-C14/Rha-Rha-C12	733	8.88	**27.02**
	Rha-Rha-C14-C14	761	12.37	**53.16**
	Total			**100%**

A

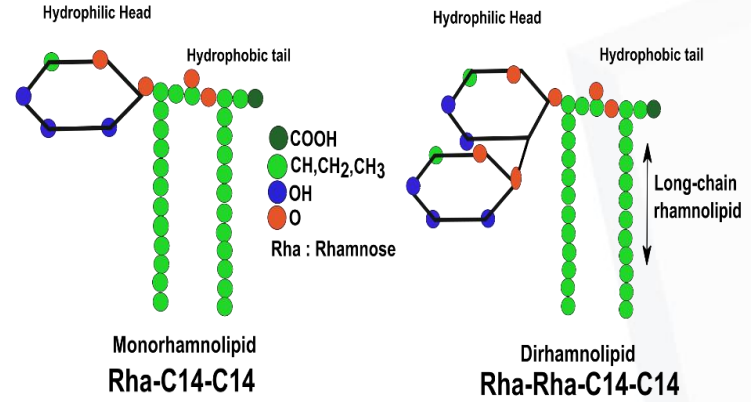


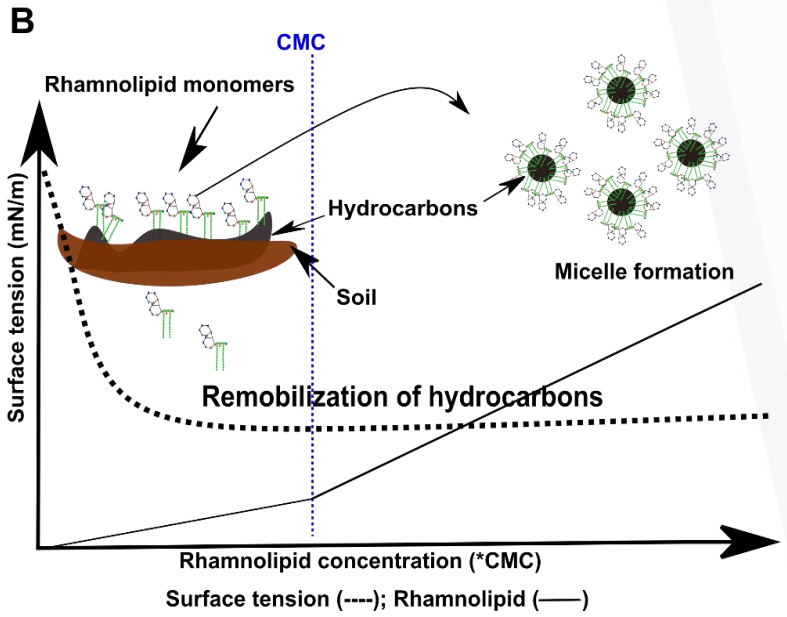
TRATTAMENTO A SCALA DI LABORATORI DI TERRENI CONTAMINATI DA IDROCARBURI CON RAMNOLIPIDI PRODOTTI DA VINACCIA NON FERMENTATA



Alif
CHEBBI

SOIL WASHING





N	Trattamento	t [h]	R
R1	0	0,5	2
R2	0	2	2
R3	0	6	2
R4	1 x CMC	0,5	2
R5	1 x CMC	2	2
R6	1 x CMC	6	2
R7	2 x CMC	0,5	2
R8	2 x CMC	2	2
R9	2 x CMC	6	2

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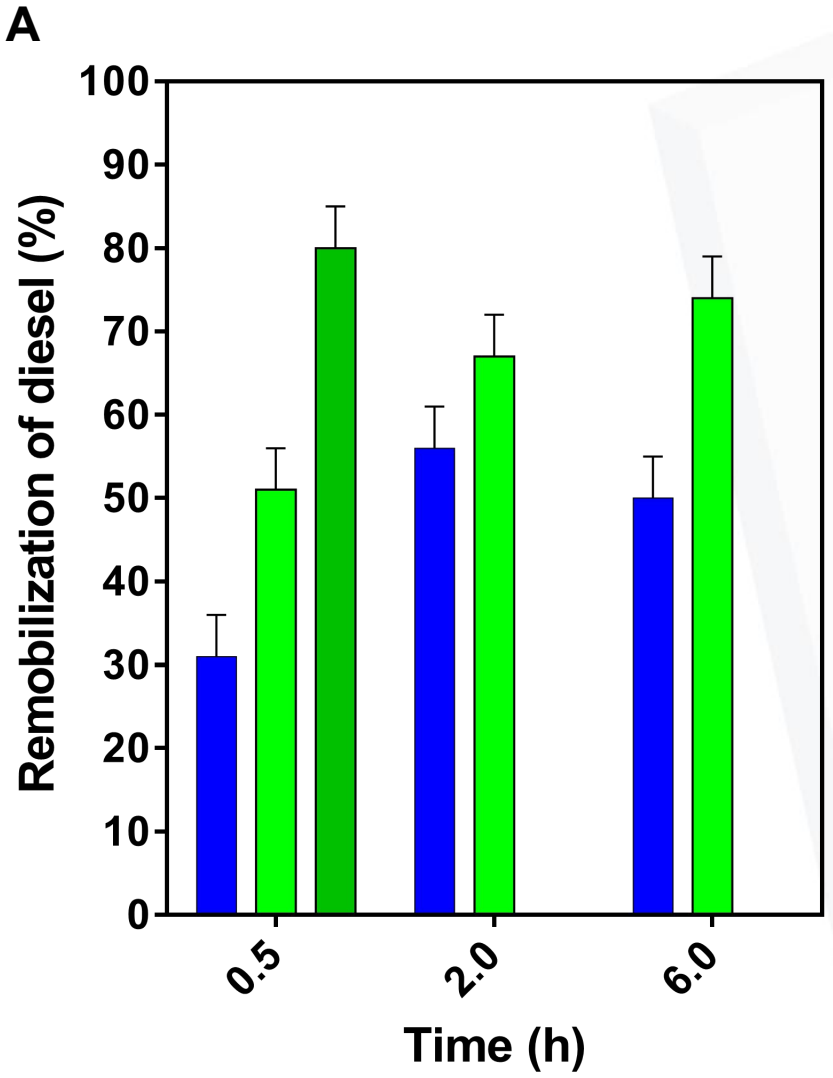
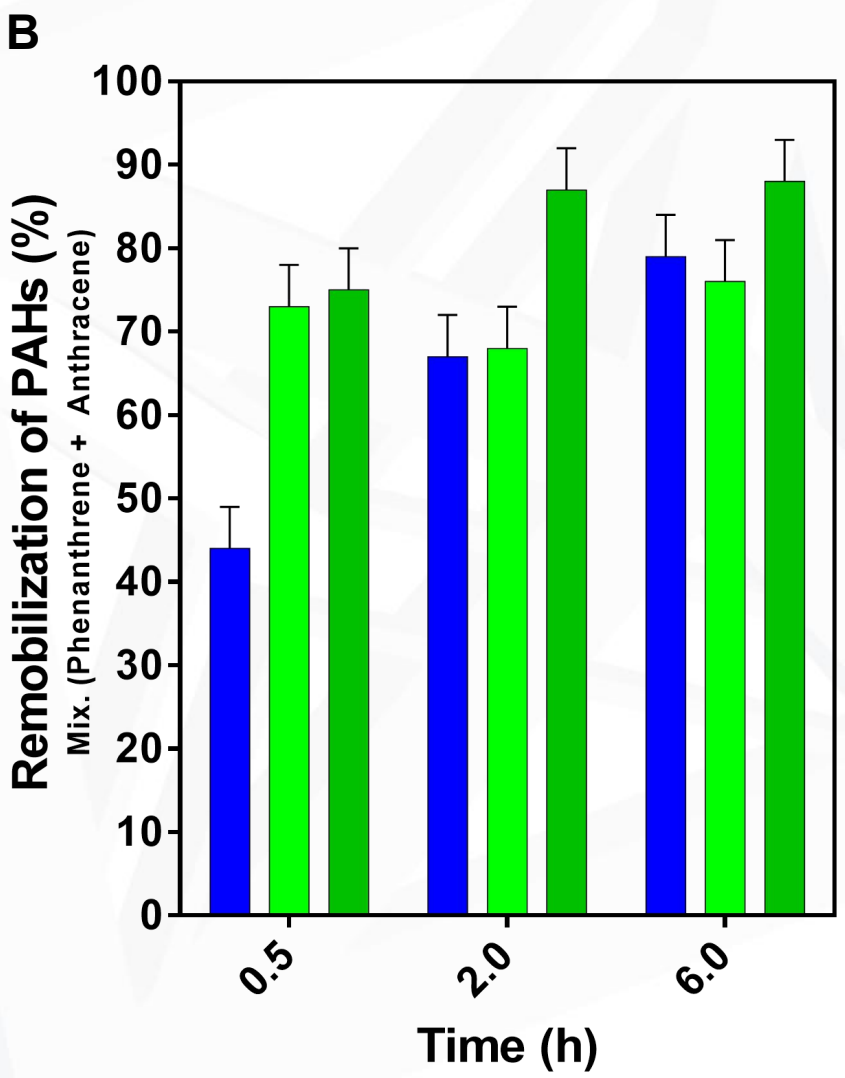
Soil Washing

Un suolo contaminato con diesel (>6000 ppm) e un suolo contaminato artificialmente con IPA (4000 ppm)





Distilled water

1 CMC ((RLs-C14-C14-VNF)

2 CMC (RLs-C14-C14-VNF)

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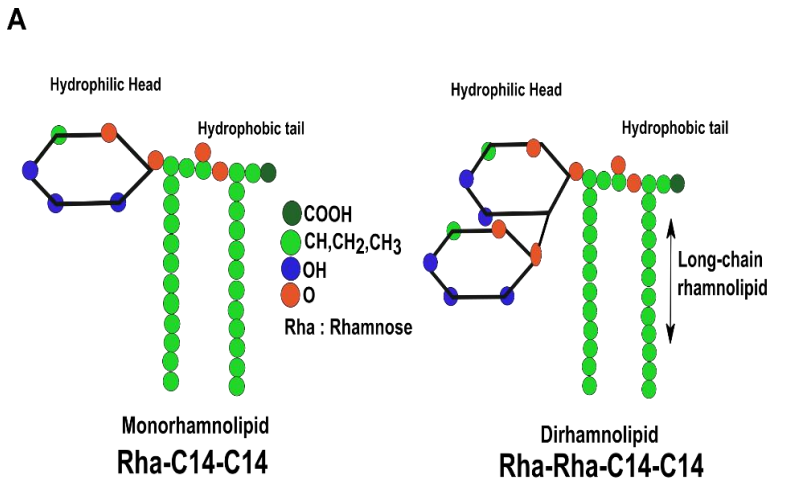
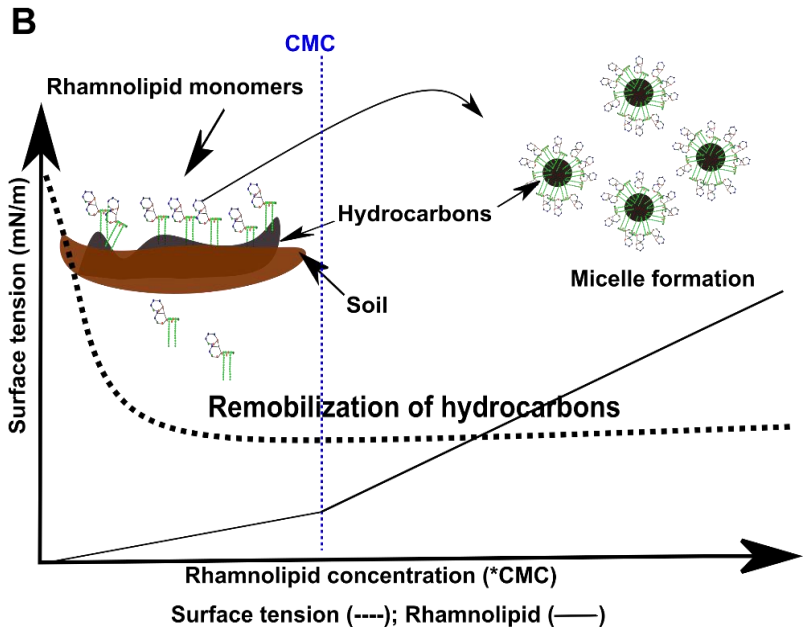
Soil Washing: Ramnolipidi da vinaccia VS tensioattivo chimico (Tween80)

Brodi contenenti ramnolipidi prodotti su vinacce non fermentate





N	SURF	Trattamento	t [h]	R
R1	-	0	0,5	2
R2	-	0	2	2
R3	-	0	6	2
R4	RAMNO	1 x CMC	0,5	2
R5	RAMNO	1 x CMC	2	2
R6	RAMNO	1 x CMC	6	2
R7	RAMNO	2 x CMC	0,5	2
R8	RAMNO	2 x CMC	2	2
R9	RAMNO	2 x CMC	6	2
R10	TWEEN80	1 x CMC	0,5	2
R11	TWEEN80	1 x CMC	2	2
R12	TWEEN80	1 x CMC	6	2
R13	TWEEN80	2 x CMC	0,5	2
R14	TWEEN80	2 x CMC	2	2
R15	TWEEN80	2 x CMC	6	2

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Soil Washing: Ramnolipidi da vinaccia VS tensioattivo chimico (Tween80)

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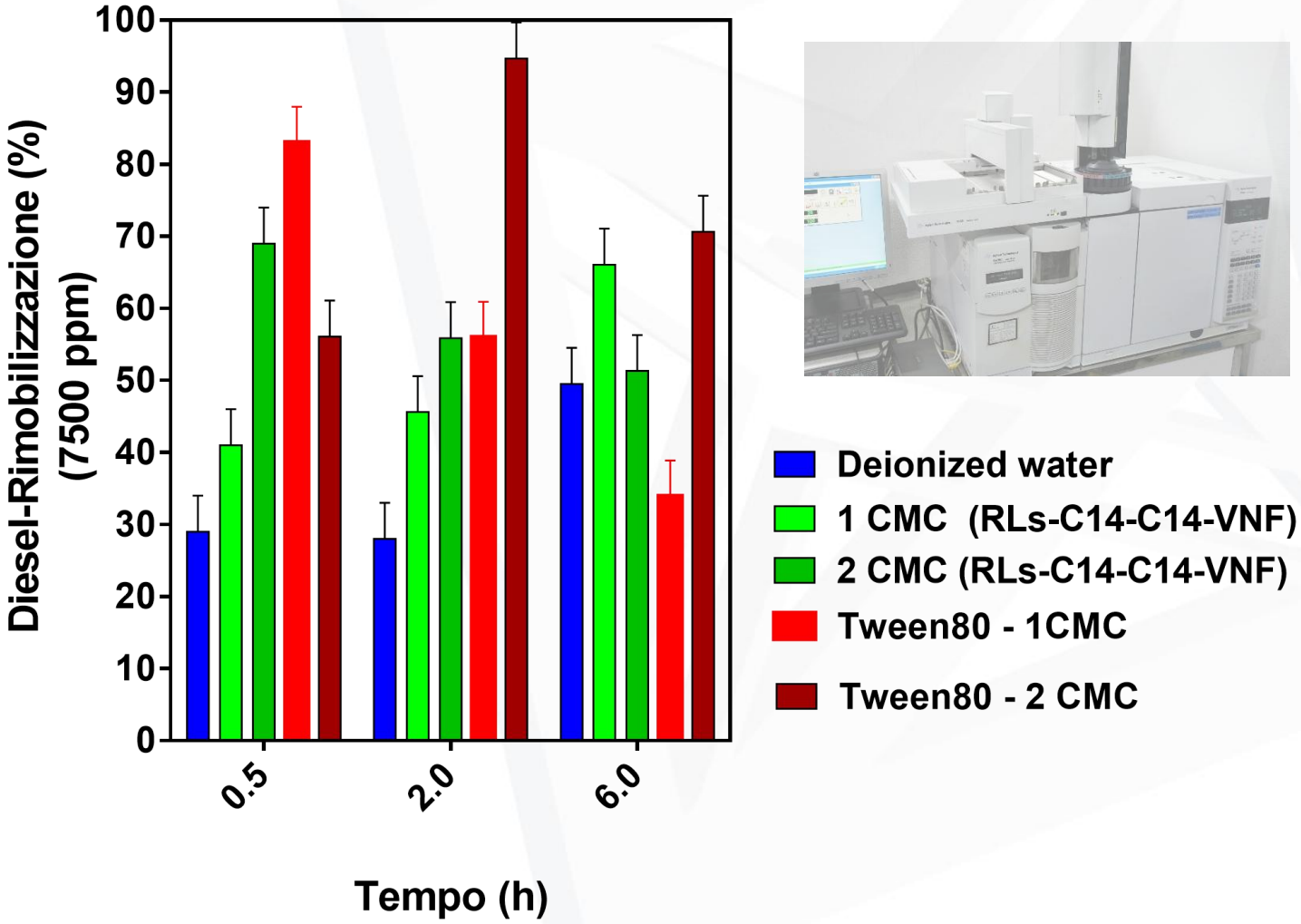
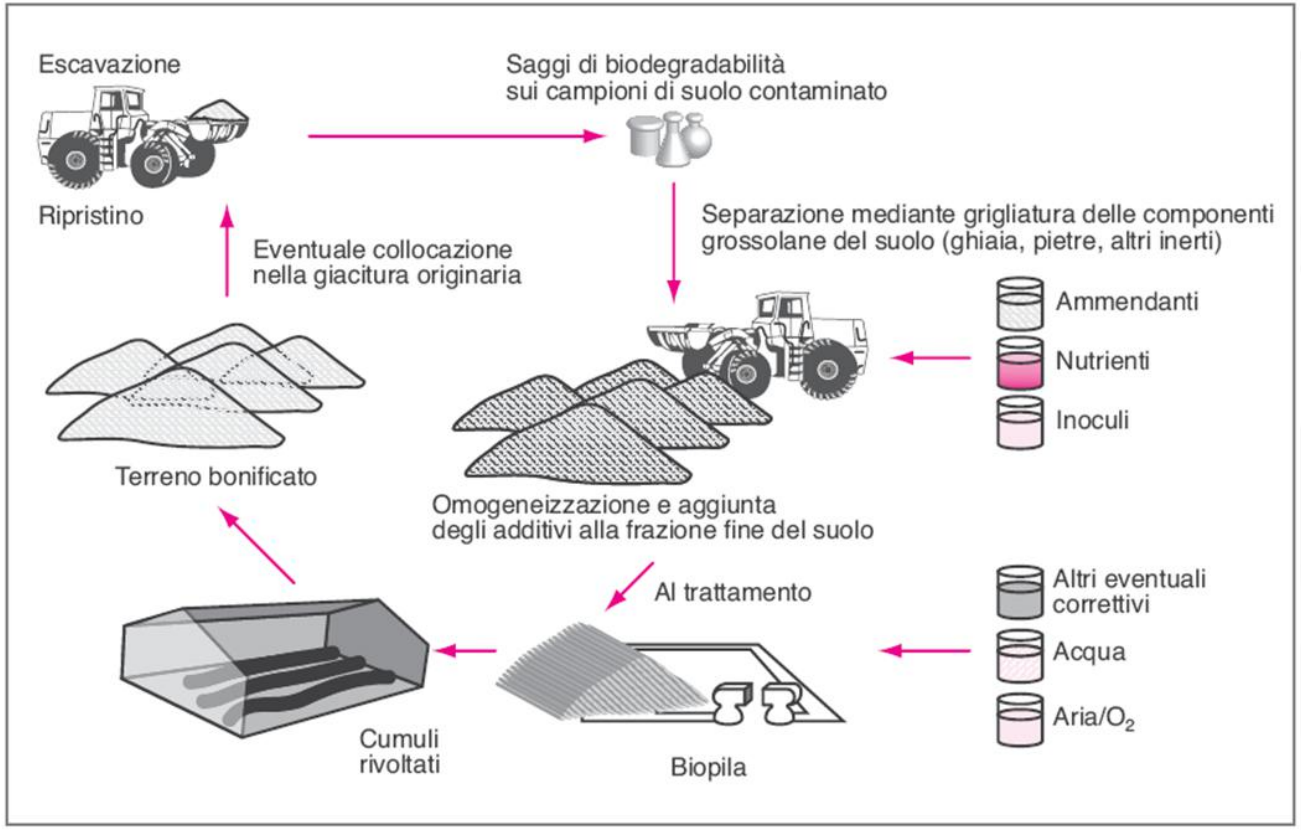
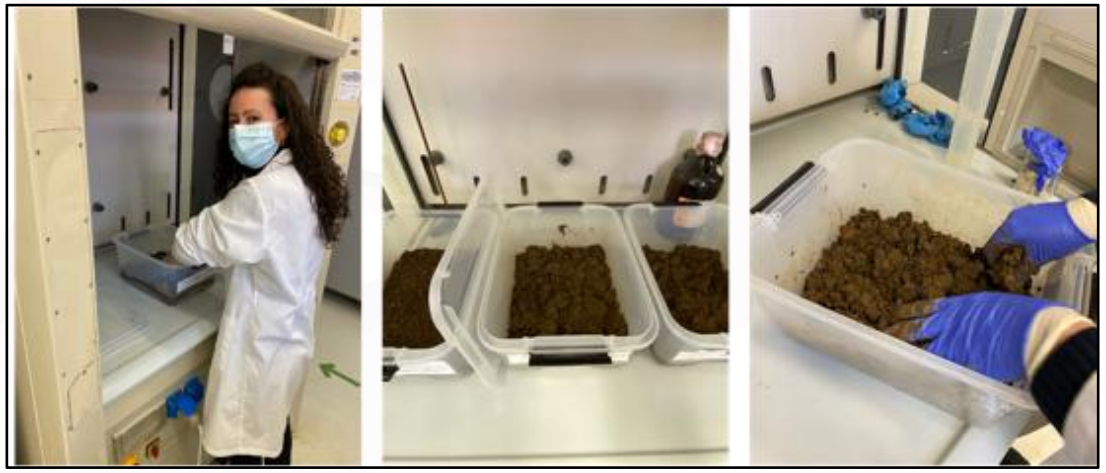


Biopile/Landfarming

Beatrice Murena



Produzione di media scala



Studio in mesocosmo

Biopile/Landfarming

Condizioni	Concentrazione RL/kg di suolo	Concentrazione brodo RH	Tempo di incubazione (gg)
Terreno contaminato (5 kg)	0	0	44
Terreno contaminato (5 kg) + brodo RH	50 mg/Kg	1 CMC	44
Terreno contaminato (5 kg) + brodo RH	100 mg/Kg	2 CMC	44
Terreno contaminato (5 kg) + vinaccia non fermentata (10%, p/p) + 10^6 cell/g suolo di E264	0	0	44

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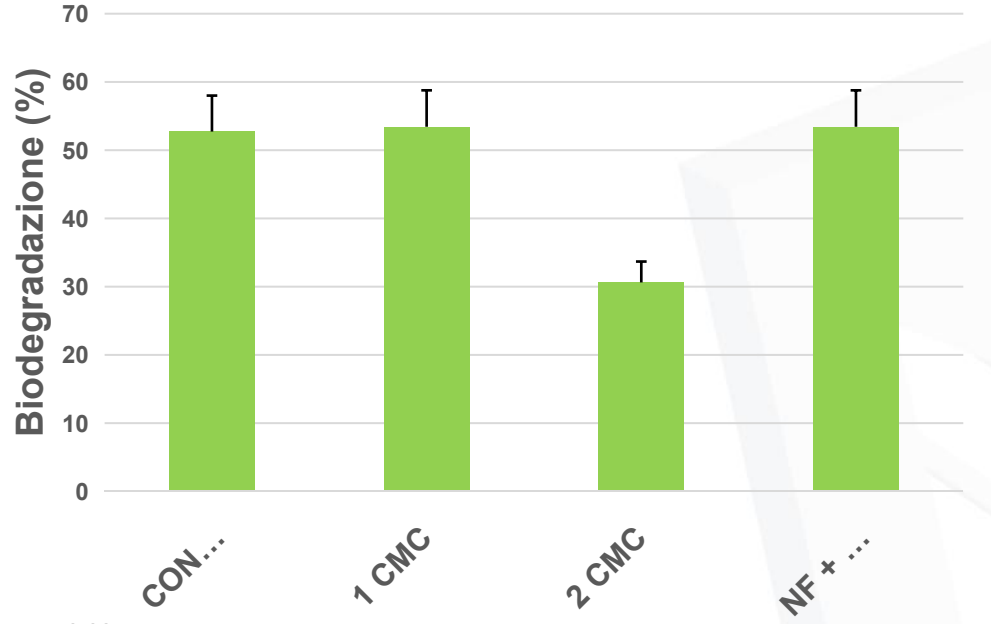
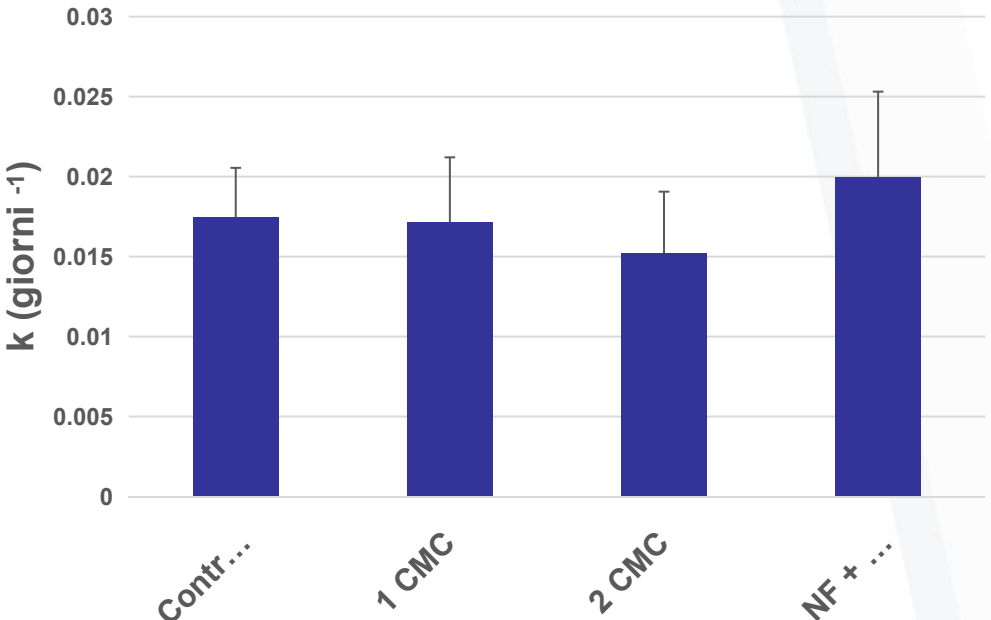
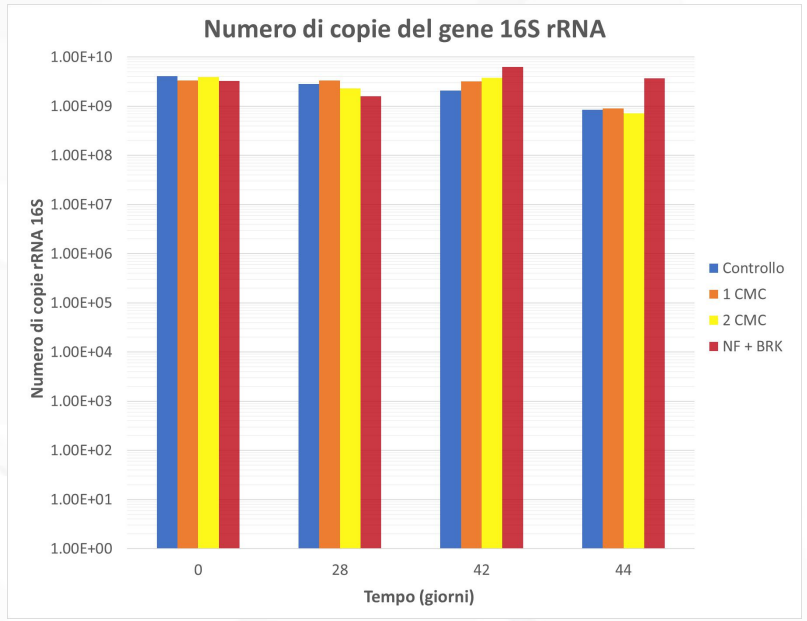
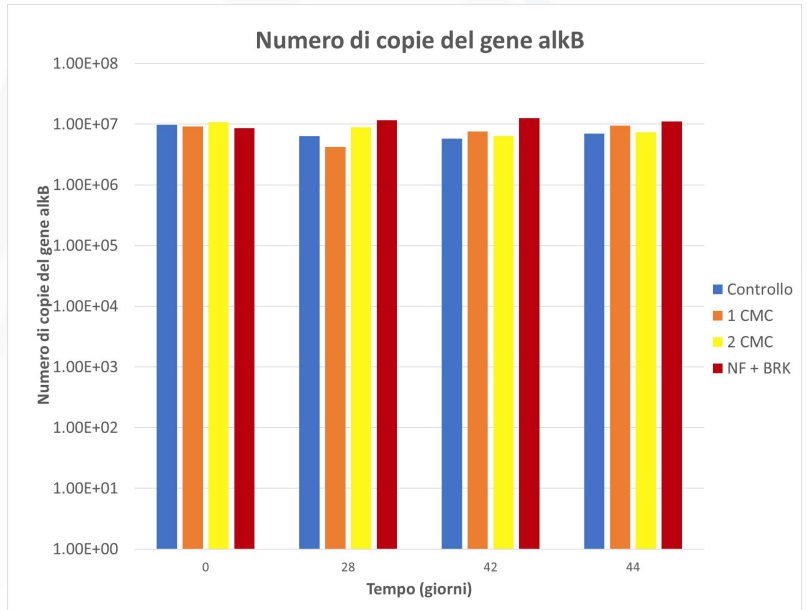
Biopile/Landfarming



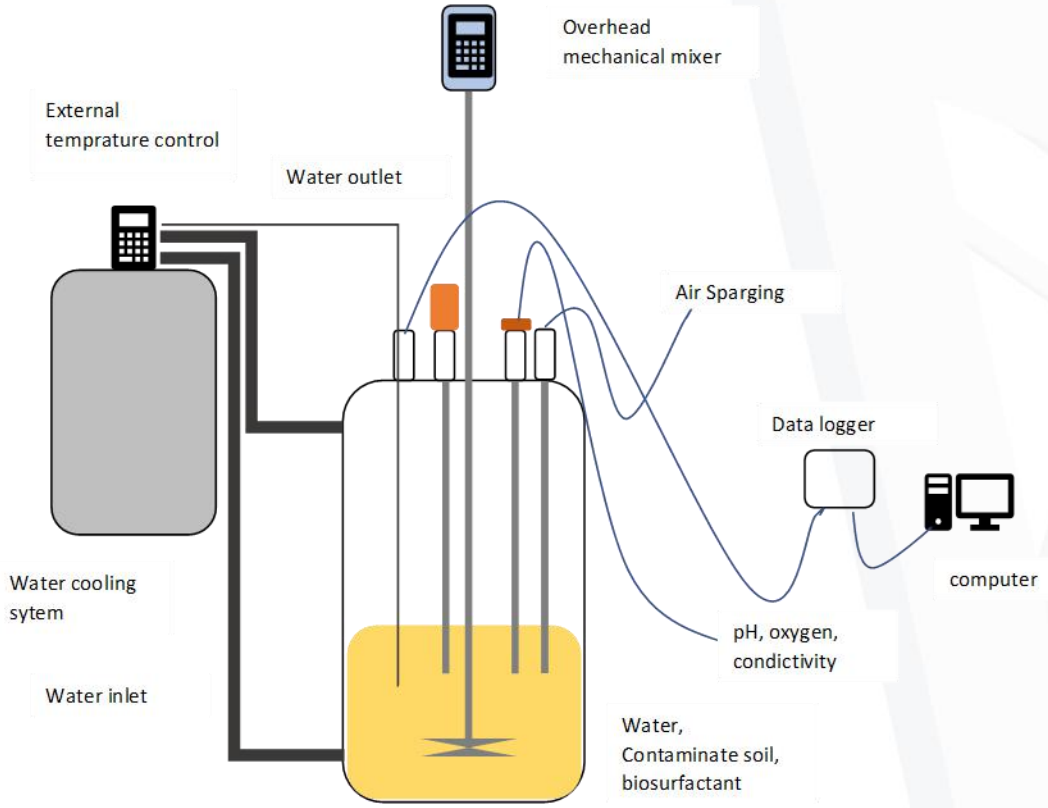


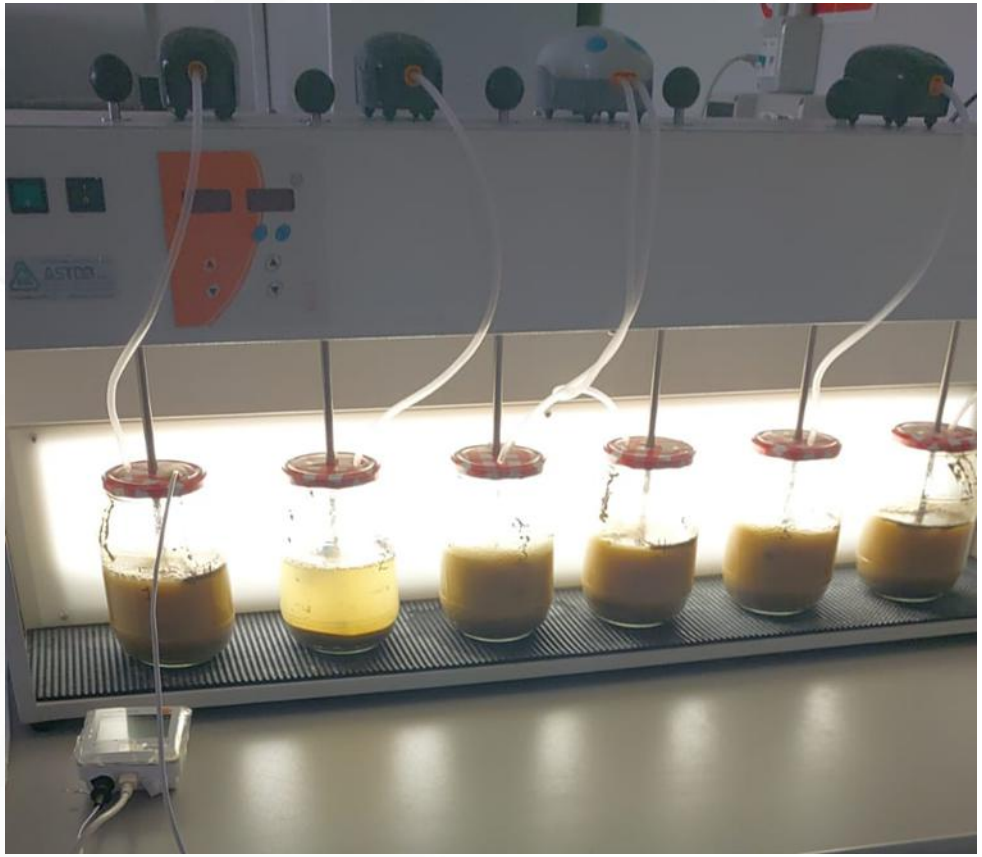




Teklit Gebregiorgis Ambaye

BioSlurry



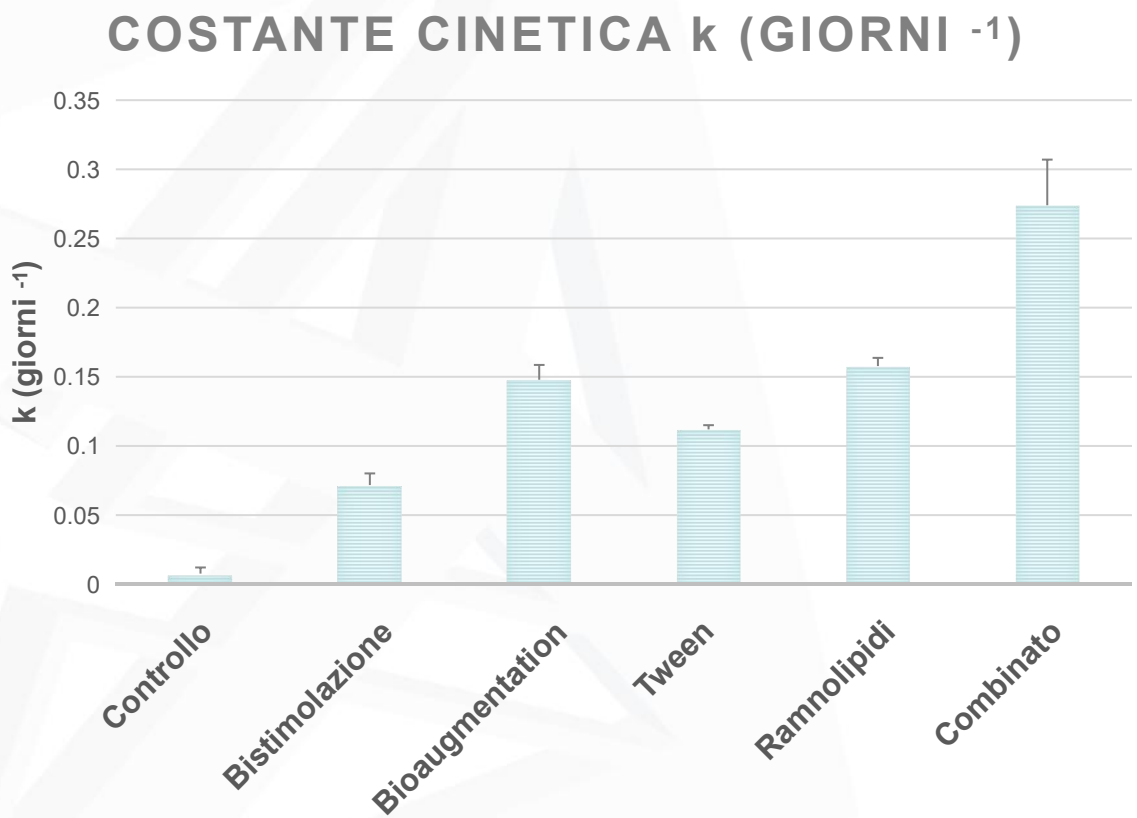


BioSlurry

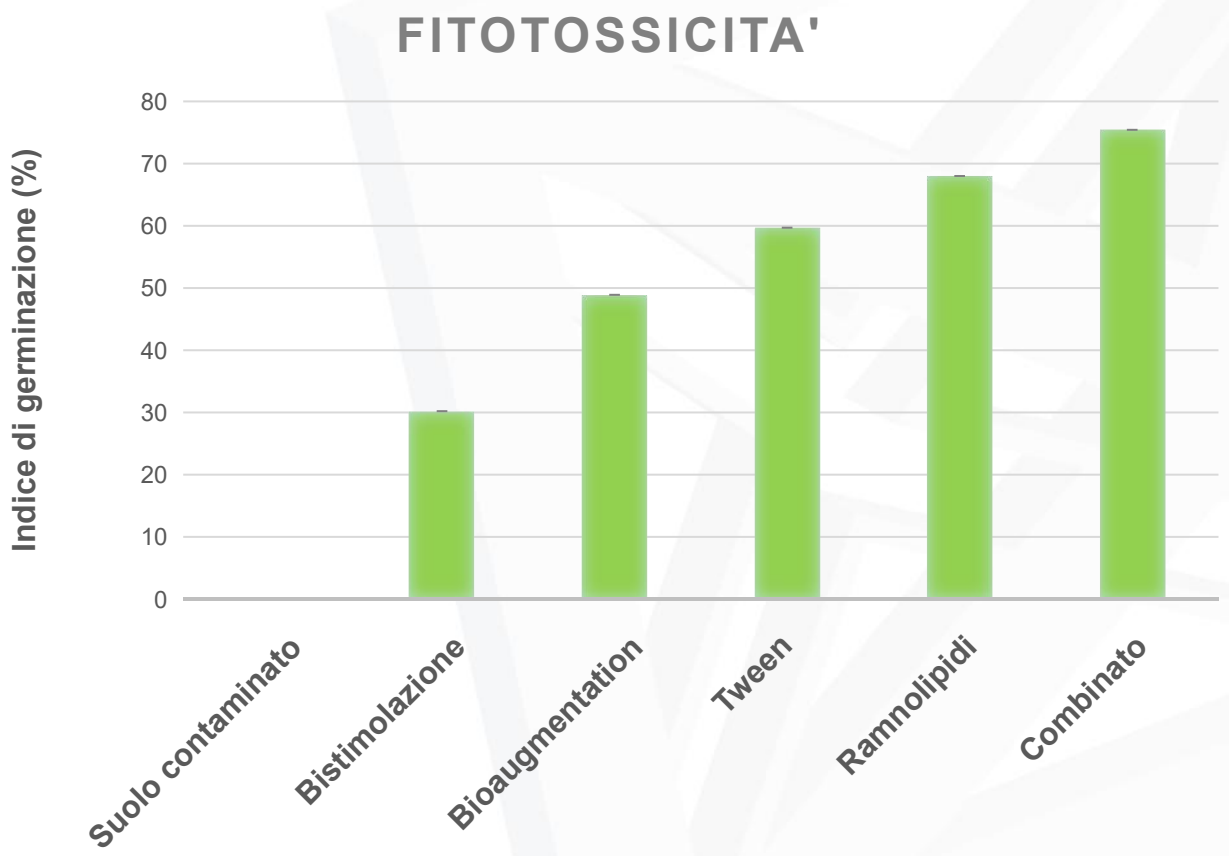
- **Controllo**: suolo
- **Biostimolazione**: suolo + nutrienti (NH_4Cl e KH_2PO_4)
- **Tween**: suolo + nutrienti (NH_4Cl e KH_2PO_4) + Tween 80 (1 CMC)
- **Bioaugmentation**: suolo + nutrienti (NH_4Cl e KH_2PO_4) + fango attivo
- **Ramnolipidi**: suolo + nutrienti (NH_4Cl e KH_2PO_4) + ramnolipidi (1 CMC).
- **Combinato:** suolo + nutrienti (NH_4Cl e KH_2PO_4) + fango attivo + ramnolipidi (1 CMC)

BioSlurry

BIODEGRADAZIONE A 10 GIORNI
Biodegradazione (%)
120
100
80
60
40
20
0
Controllo
Bistimolazione
Bioaugmentation
Tween
Ramnolipidi
Combinato

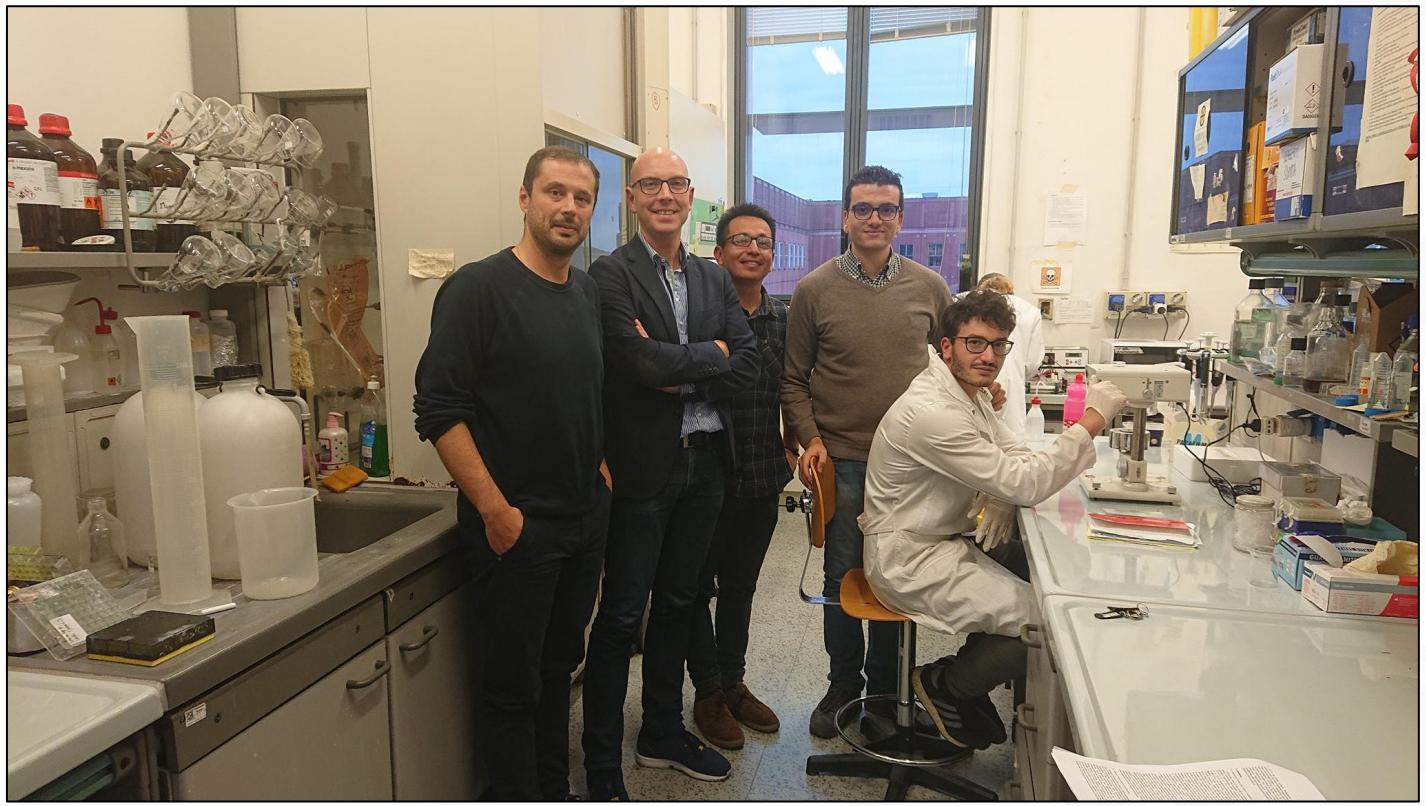

COSTANTE CINETICA k (GIORNI -1)
k (giorni -1)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Controllo
Bistimolazione
Bioaugmentation
Tween
Ramnolipidi
Combinato

BioSlurry


FITOTOSSICITA'
Indice di germinazione (%)
80
70
60
50
40
30
20
10
0
Suolo contaminato
Bistimolazione
Bioaugmentation
Tween
Ramnolipidi
Combinato

CONCLUSIONI

- Biotensioattivi prodotti da batteri non patogeni si sono dimistrati efficaci nel rimuovere idrocarburi dai suoli con le tecnologie del soil washing e bioslurry
- Questi approcci necessitano di grandi volume di soluzioni acquose contenenti i tensioattivi.
- L'applicazione industruiale di questo approccio dipende dai costi associate alla produzione su larga scala
- Questi costi andranno stimati in una successive fase sperimentale



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E
FIORINO

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Dipartimento di Scienze dell' Ambiente e della Terra

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