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INFLUENCE OF NEWLY ADDED BIO COMPONENTS ON THE FATE AND PERFORMANCE OF FUELS IN ENVIRONMENT

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Presentation objectives



- **Research project on how does the addition of bio components influence physical properties of fuels and what consequences does it have in case of leakage**
- **2 yrs, co-financed by the Czech Ministry of Transport**
- **Presentation of partial results**
 - 1) Legislation base**
 - 2) Biodegradation tests**
 - 3) Sorption tests**
 - 4) Conclusions**
 - 5) Plans for 2010**

Legislation base

2003/30/EC: EU directive on the promotion of the use of biofuels for transport

- Member states: indicative targets on minimum proportion of biofuels placed on national markets are set:
 - By 2010: 5,75% of energy content
 - By 2020: 8% of energy content

180/2007: Czech law on air conservation

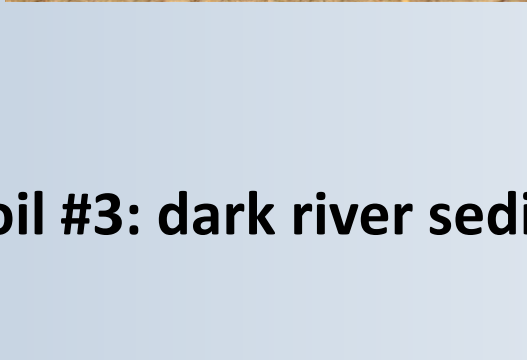
- minimal content of bio components in fuels
 - Petrol + bio-ethanol: 3,5 – 5 (10) % V/V
+ MTBE (or bio-ETBE): max. 15 (22) % V/V
c (O₂) in the mixture is max. 2,7 (3,7) % W/W
 - Diesel + FAME 4,5 – 5 (7) % V/V

Biodegradation tests 1/7

Soil #1: brown middle humus clay ⇒



⇒ Soil #2: poor yellow sandy ground



Soil #3: dark river sediment, rich in humus ⇒

Biodegradation tests 2/7

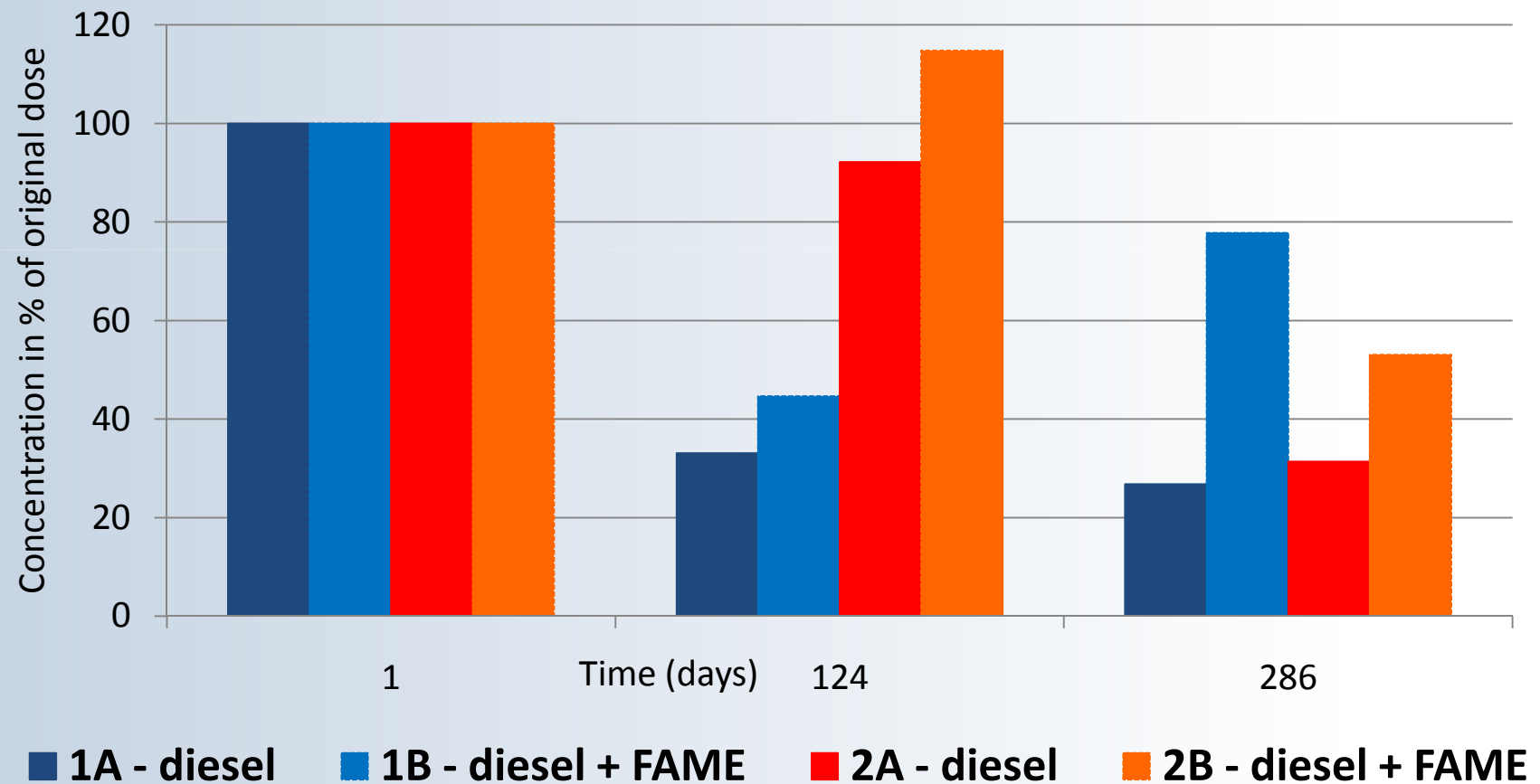


- Soil sieved through 2 mm sieve
- Samples A-D contaminated to the concentration 10g/kg
- Samples E – blank samples
- Regular irrigation by tap water
- No other additions

Sample	Fuel	Bio component	MTBE
A	Diesel 10 000 ppm	None	None
B	Diesel 10 000 ppm	FAME 5% V/V	None
C	Petrol 10 000 ppm	None	15% V/V
D	Petrol 10 000 ppm	EtOH 5% V/V	4% V/V
E	None	None	None

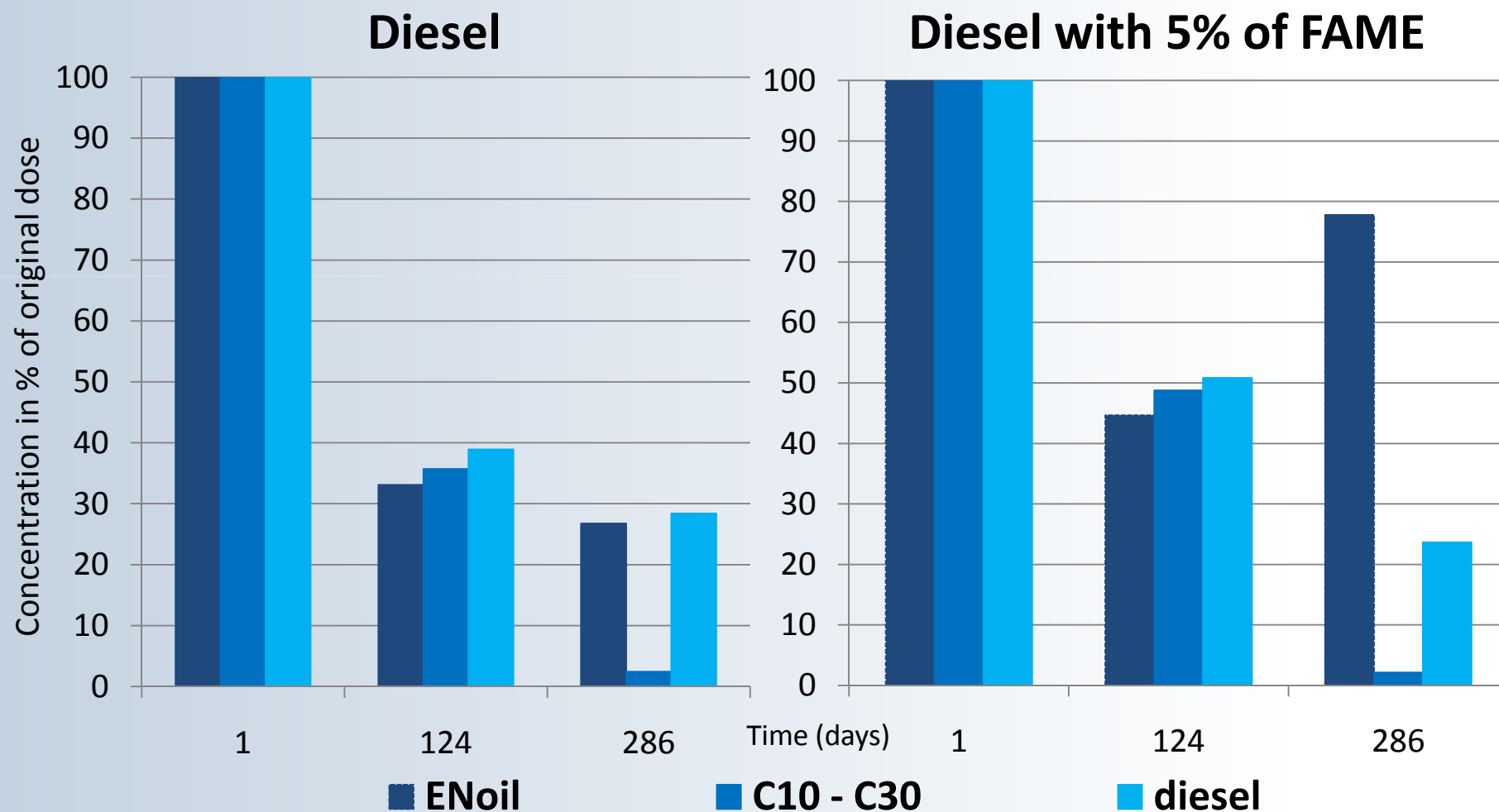
Biodegradation tests 3/7

Concentration decay of diesel in samples - standard solution: ENoil



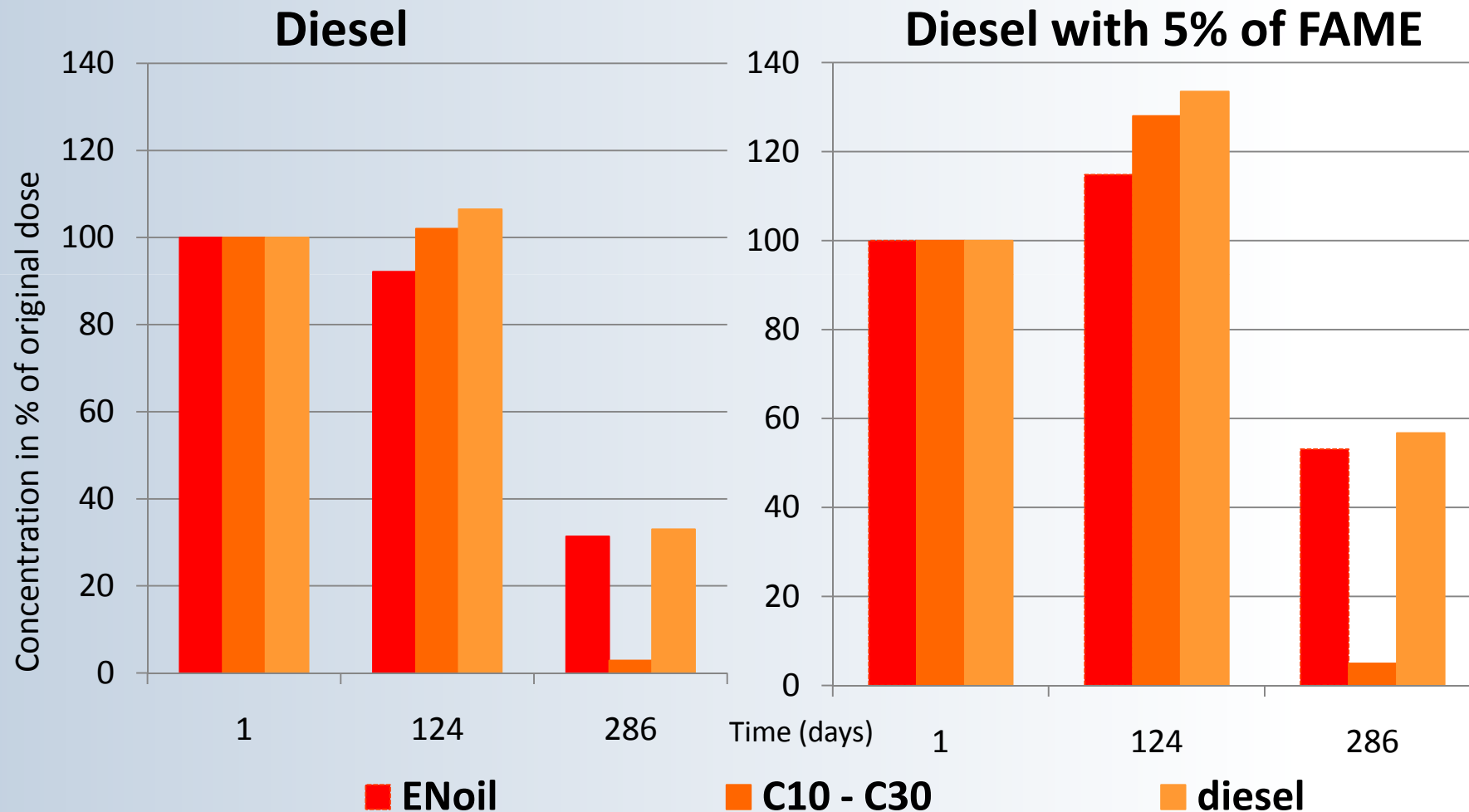
Biodegradation tests 4/7

Different standard solutions - soil # 1



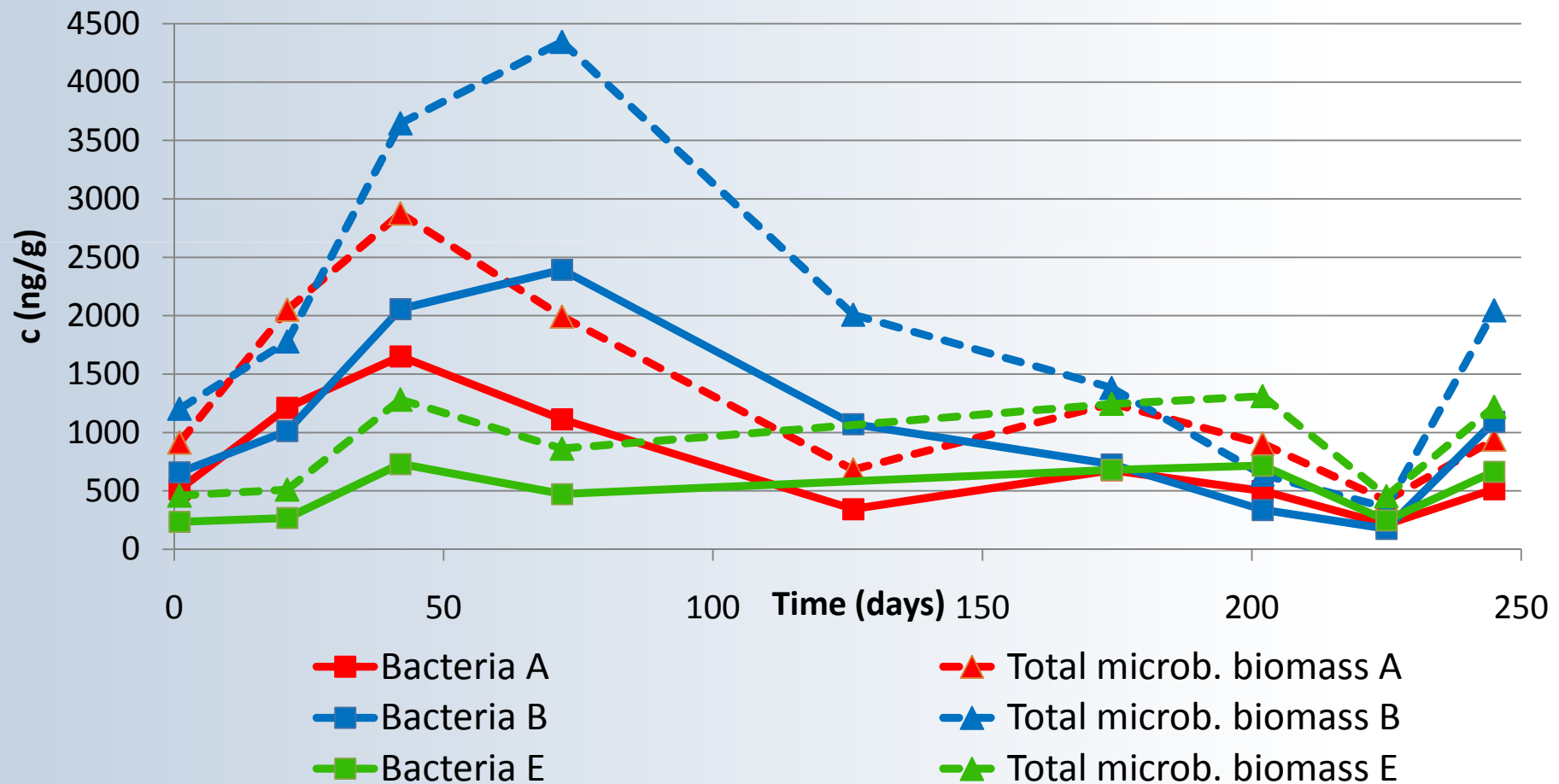
Biodegradation tests 5/7

Different standard solutions - soil # 2



Biodegradation tests 6/7

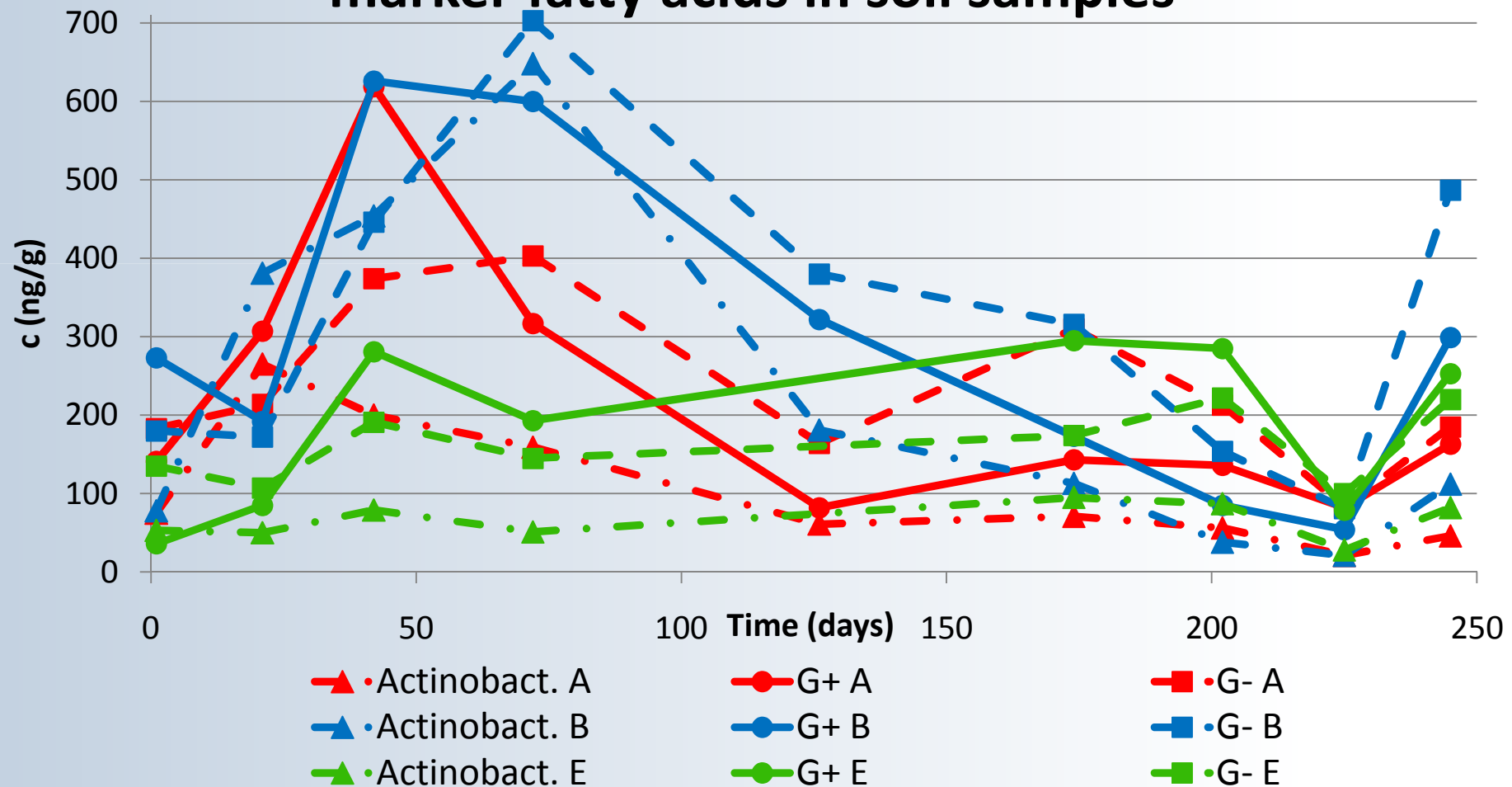
Concentration of specific phospholipidic marker fatty acids in soil samples



Biodegradation tests 7/7

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Concentration of specific phospholipidic marker fatty acids in soil samples



Sorption tests 1/3



- 4 different sorbents
- 60 minutes of soaking
- 20 hours of draining away in a special sieve
- Each sample in four parallels

LBL	Fuel	FAME
D1	Diesel	None
D2	Diesel	0,2 % V/V
D3	Diesel	5 % V/V
D4	Diesel	7 % V/V

Fuel	EtOH	MTBE
Petrol	None	15 % V/V
Petrol	5 % V/V	4 % V/V
Petrol	7 % V/V	5,5 % V/V
Petrol	10 % V/V	None

Sorption tests 2/3

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⇒ **VAPEX**
(hydrophobic pearlite)

ECO DRY plus ⇒
(bergmeal)



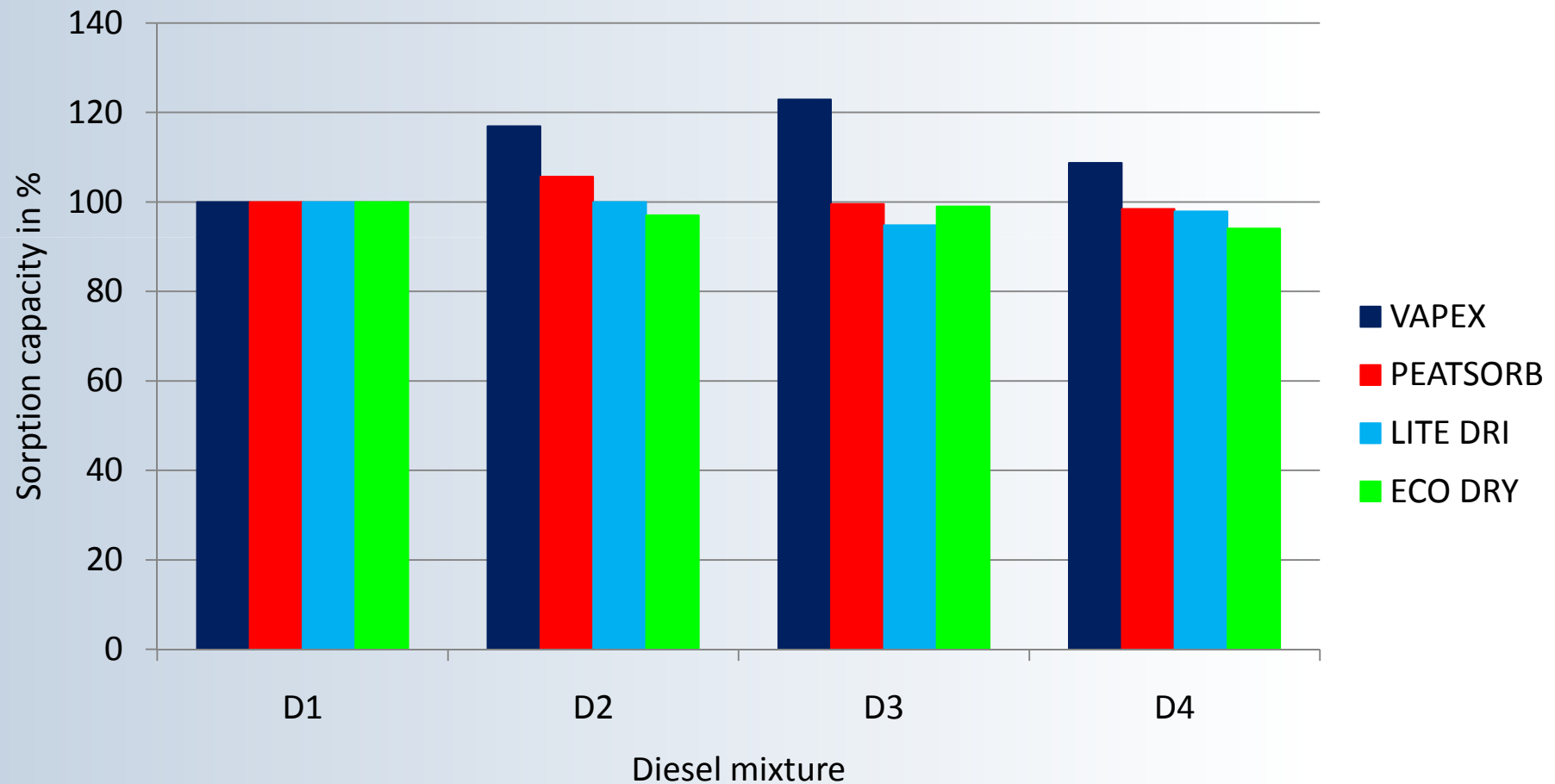
⇒ **PEATSORB**
(hydrophobic peat)

LITE DRI duplex ⇒
(cellulose)



Sorption tests 3/3

Comparing the affinity of tested diesel mixtures to four tested sorbents



Conclusions

- The standard EN solution for determining the content of diesel in the samples may not be the most suitable one when analyzing diesel with 5% V/V of FAME.
- 5% V/V FAME in diesel mixture can positively affect the prosperity of the autochthonous microbial population in the soil sample compared to the sample contaminated with diesel without FAME addition.
- Addition of FAME into the diesel up to 7% V/V negatively influences the affinity of the mixtures to the tested sorbents only minimally. Diesel containing 0,2 to 7% of FAME shows slightly stronger affinity to the VAPEX sorbent, than diesel without bio components.

Plans for 2010



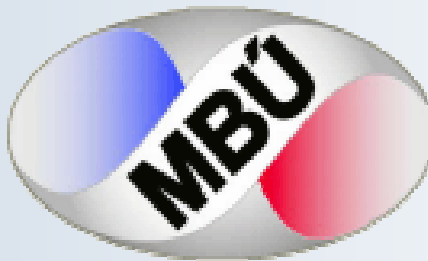
- **Biodegradation of petrol in tested samples evaluation**
- **Biodegradation of bio components in tested samples evaluation**
- **Biodegradation in river sediment evaluation**
- **Pilot scale biodegradation test**
- **Sorption tests with petrol mixtures**
- **Migration tests of petrol and diesel mixtures through soil horizon**
- **Testing of the destruction of MTBE in water solution , using a photocatalytic reactor**

Acknowledgments

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- Tomas Cajthaml
- Petr Smejkal



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Thank you for your attention!

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