TREATMENT OF COW-FARM WASTEWATERS USING AN ENVIRONMENTALLY FRIENDLY METHOD

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INTRODUCTION

Introduction (1)

A cow-farm of wastewaters rejection without control creates serious environmental problems

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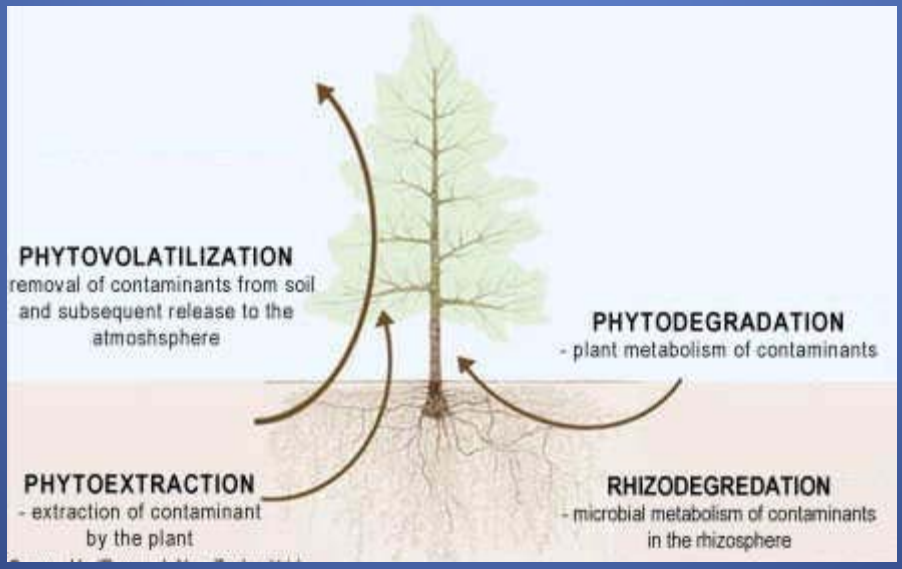
Frequent complaints rise - these wastewaters end up in non approved areas

This process creates environmental pollution at least in surface waters

Introduction (2)

The scientific community is conducting research to establish treatment methods

Phytoremediation



Phytoremediation (1)

Group of technologies which use plants (and their possible synergy with microorganisms) for the *in situ* partial or full restoration of contaminated soils, sludges, sediments and surface or groundwater [1,2]

Newly evolving field of science and technology for cleaning

- soil
- water
- air

Phytoremediation (2)

Phytoremediation technologies are used for

organic pollutants inorganic pollutants

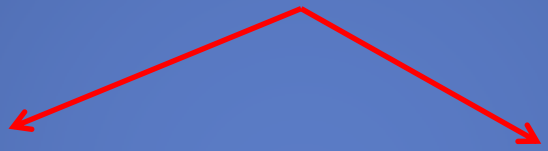
Hydrocarbons	Explosives
Chlorinated compounds	Heavy metals
Pesticides	Metalloids
Antibiotics	Radioactive materials

The use of plants has

- evolved to the construction of treatment wetlands
- planting trees to counteract air pollution

Phytoremediation (3)

Public and private funds have been funneled into research at the laboratory, greenhouse, and field scale



to identify appropriate plants for different kinds of contamination

to establish the actual remediation performance of various plant species in different media and contaminants

Qualitative Assessment

Cow-farm wastewaters contain:

- Nitrogen
- Phosphorus
- Potassium
- Metals
- Suspended solids
- Pathogenic microorganisms
- Organic compounds
- etc

Parameters that should be received:

- BOD
- COD
- TOC
- Determination of nitrogen
  - Phosphorus
  - Suspended solids
- PH
- etc

QUALITATIVE ASSESSMENT

Assessment of Toxicity (1)

Many bioassays to asses the toxicity of wastewater ⇨ Plants [3]

The plant bioindicator offers advantages:

- wide range of final assessment
- low cost of support
- quick start of bioassay

with particular advantages for the dynamic ecotoxic review of the wastewater

Assessment of Toxicity (2)

For this purpose, it is used species [4,5]

- oats (*Avena sativa* L.)
- chinese cabbage (*Brassica campestris* L.)
- onion (*Allium cepa* L.)

Method *Allium cepa* L: easy and sensitive tool for measuring the total toxicity caused by chemicals treatments ⇨ growth inhibition of the roots of onion bulbs [5]

Degree of toxicity of test chemicals ⇨ measuring the length of the roots in the third day of the experiment [5]

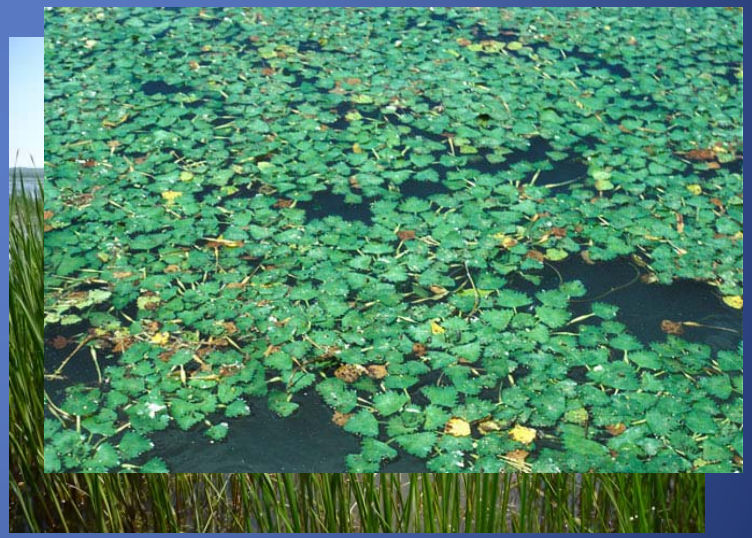
Lake of Orestidos - Kastoria (Greece)

Plants for Remediation

- **Plant taxa (Scientific name)**

Ceratophyllum demersum L.
Stuckenia pectinata (L.) Börner

Butomus umbellatus L.
Trapa natans L.



Method of Application

Process of Phytotoxicity Assessment (1)

After 9 days (5/8/2014 - 14/5/2014) samples were extracted from each bottle

Thivas commercial onions (diameter: 1.0 - 1.5 cm, length of roots: 0.0 cm)

The experimental procedure took place at room temperature for 3 days

The control onions were placed in enriched with nutrients tap water

Process of Phytotoxicity Assessment (2)

Twelve samples were used per plant species

All samples contained 11 mL of solution and they were placed in glass test-tubes (12 mL) where in the top of the tube was placed an onion

The solution that was absorbed by each onion (0.5 - 1 mL) was replaced it every 8 hours whereas every 24 hours each solution was replaced it with correspondingly new-fresh- one

Reversibility

After 72 hours of the experiment half of the samples in each treatment were replaced them with correspondingly new-fresh- one solution whereas the other half were replaced them with the control solution

Purpose: to noted if the onions can recover the shock which were submitted from each toxic wastewater... in other words to noted if the effect was reversed

If root growth is better in the water-filled test tubes than in the test samples the effect is reversible

RESULTS & DISCUSSION

Removed a Cow-Farm Wastewaters

Samles	Final volume
Photolysis	1980,2
Ceratophyllum demersum I	1951
Ceratophyllum demersum II	1960,8
Butomus umbellatus I	1976,7
Butomus umbellatus II	1946,5
Stuckenia pectinata I	1955
Stuckenia pectinata II	1934,1
Trapa natans I	1955,3
Trapa natans II	1935,3

Phytotoxicity - Reversibility

Samples	% of control	Reversibility
Control	100	-
Initial	52.50	No
Photolysis	72.50	A little
Ceratophyllum demersum L.	76.25	Slighest
Butomus umbellatus L.	71.25	Minimum
Stuckenia pectinata (L.) Börner	93.75	Minimum
Trapa natans L.	81.11	No

The "fate" of cow-farm of wastewaters in the algae has not been measured yet, so it is not known how much (if any) have been metabolized by the algae. Further studies are required in order to identify the "fate" in the algae and more precisely in order to quantify how much of the absorbed wastewater is removed by transpiration, how much is metabolized by the algae and how fast these processes occur

The results of such studies will enable us identify appropriate species for water and soil decontamination

A system is constructed for the assessment of the "fate" of cow-farm wastewaters during phytoremediation

References

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