Soil Nitrogen Leaching from Different Textural Soils Based on Fertilization and Activity of Soil Organisms

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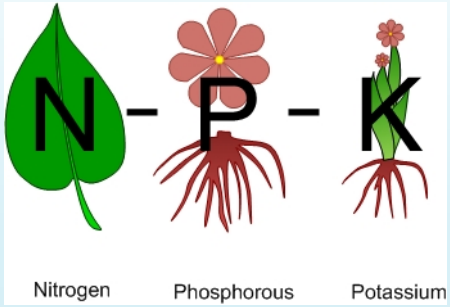
INTRODUCTION

- The use of nitrogen based fertilizers – factor for increased agricultural production in the world.

- Disadvantages:
  - soil pH reaction change
  - changes in soil biota activity
  - nitrogen leaching
  - negative environmental impacts



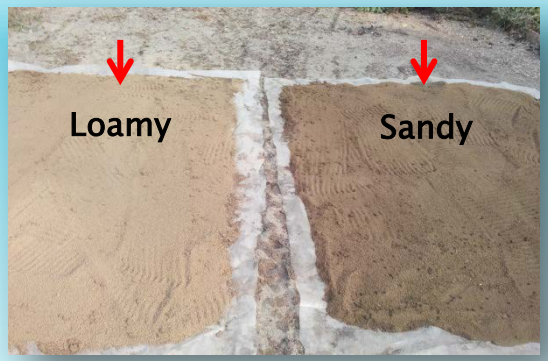
OBJECTIVE

Necessity: deepen the understandings about soil leaching – to avoid pollution.

- Aim: the role of soil texture in combination with different fertilizers and soil organisms on leaching phenomena.

EXPERIMENTAL DESIGN

SOIL



FERTILIZERS

Org.fert manure

Min.fert $N_{20}P_{20}K_{20}$

Control without fertilizer

SOIL FAUNA

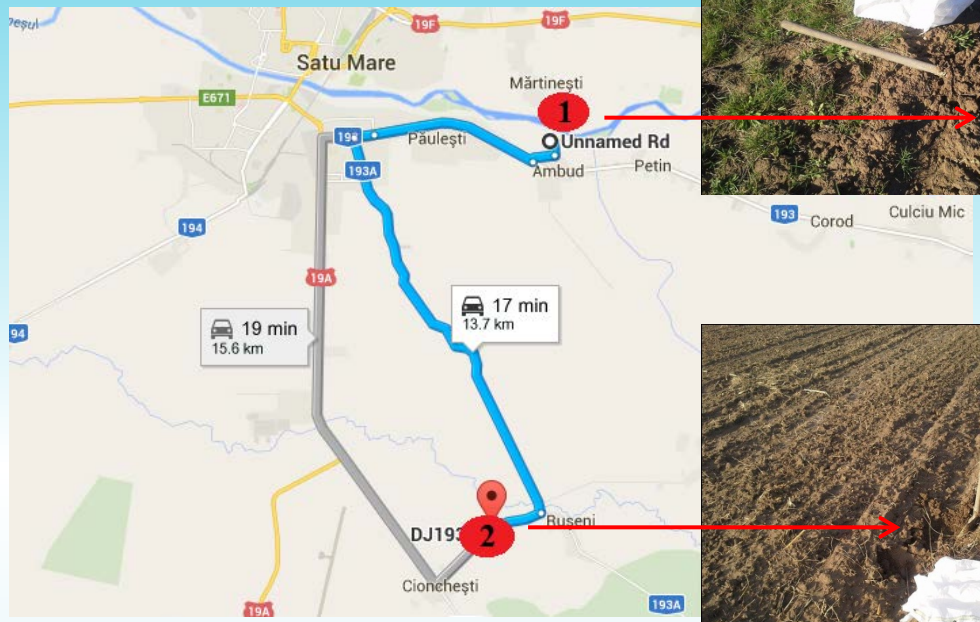
Colembolans
Folsomia candida

Earthworms
Lumbricus terrestris

MATERIAL AND METHODS

- Arable fields
- Dried 20°C
- Sieved 2 mm
- Humidity 20 %
- DA= 1.2 g cm^{-3}

SOIL



General characterization of the experimental soil properties

Properties	First soil	Second soil
pH	6.33	6.83
Carbohydrates	0.42	0
Humus	2.38	2.69
Texture	Sandy	Loamy

MATERIAL AND METHODS

FERTILIZERS

100 kg N/ha s.a

Org.fert
Manure

70 g/pot

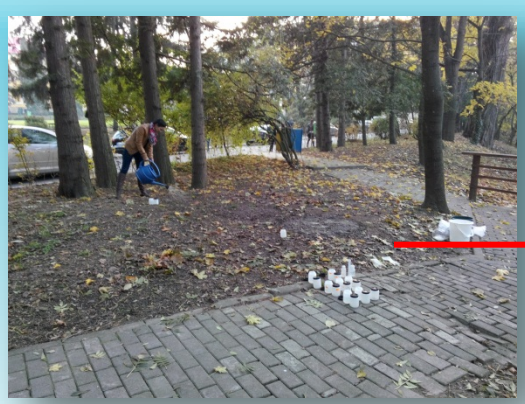
Min.fert
$N_{15}P_{15}K_{15}$

1.9 g/pot

Control
without fertilizer

MATERIAL AND METHODS

SOIL FAUNA



Earthworms extraction

Adaptation and storage

Procedure of washing–weighing–sorting

Inoculation 2 Ind/pot

Colembolans from pure culture

Inoculation 400 Ind/pot

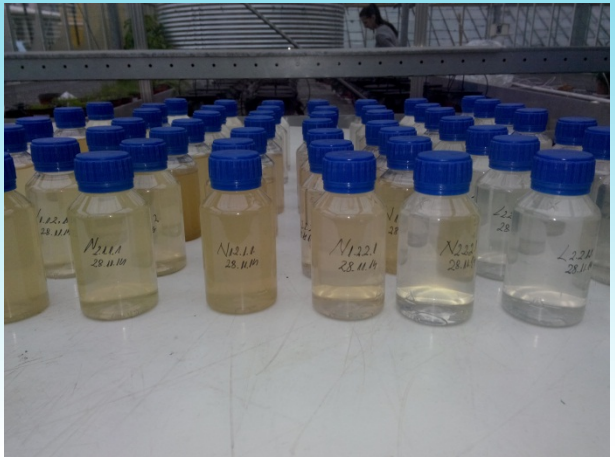
Microcosms covered at the top and buttom with microporous material to avoid animals for escaping

MATERIAL AND METHODS

A system of plastic wires and irrigation computer → leaching effect

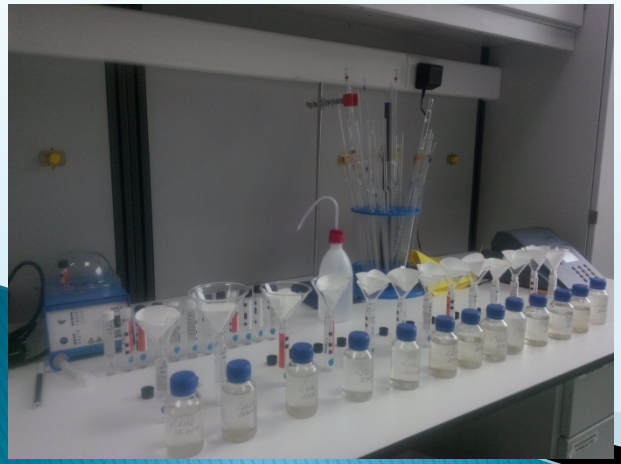
Water was dripping inside each column in the same quantity (200 ml/week/container)

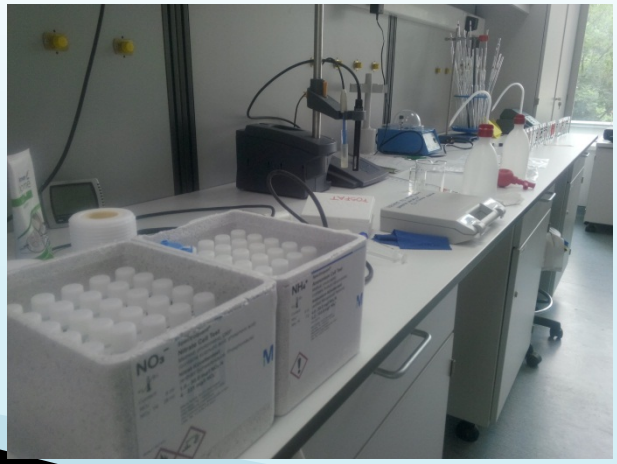
Leachate was collected in 2 sampling weeks (2^{nd}; 7^{th}) in 100 ml plastic containers



Ammonium and nitrate were measured by spectrophotometric method – PhotoLab S12

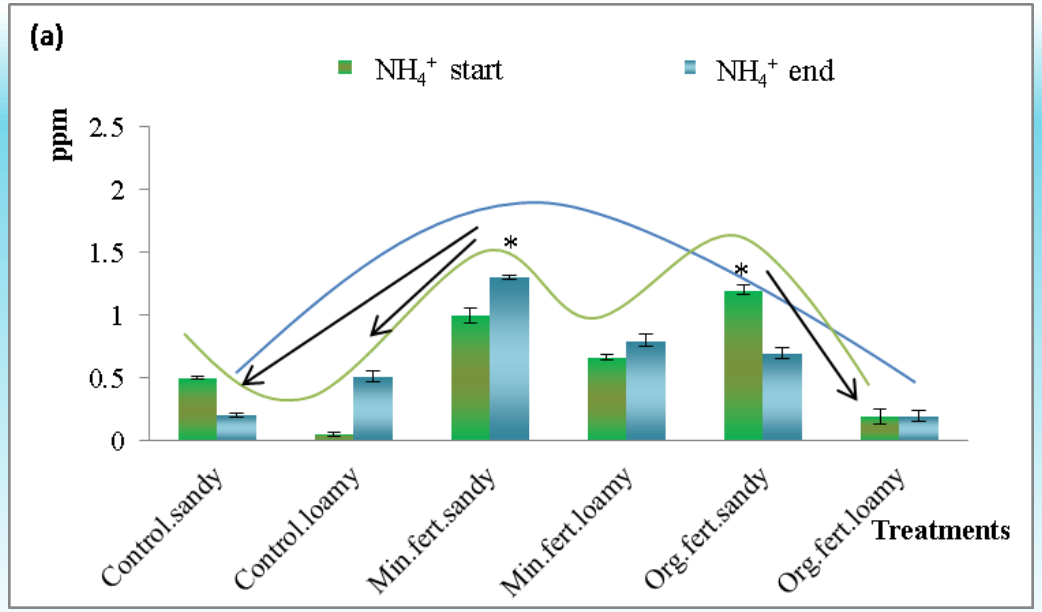
Leachate → stored - 20^0C → filtered → analyzed





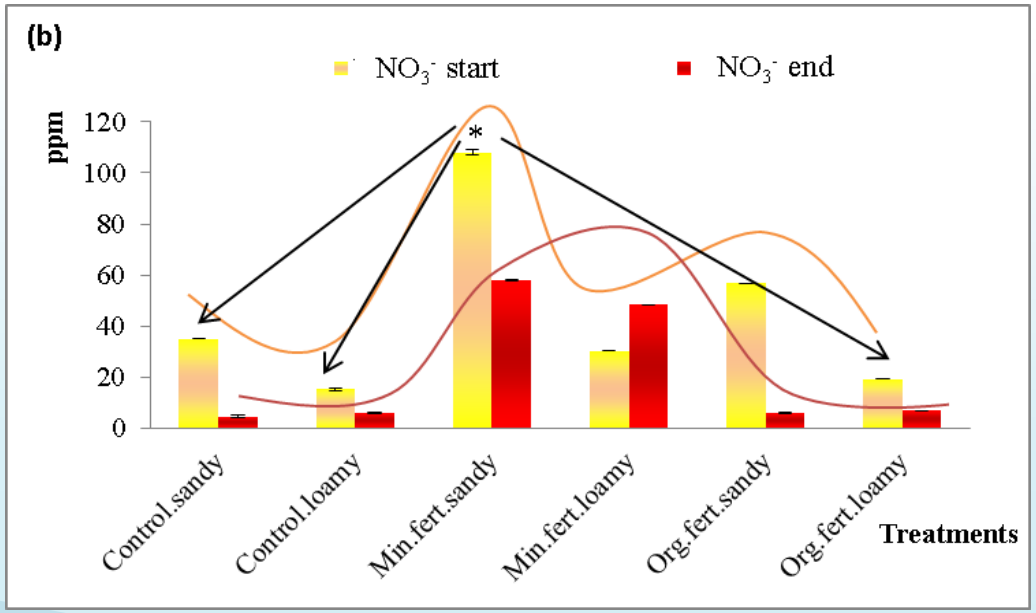
RESULTS AND DISSCUSIONS

(a) Ammonium and (b) nitrate dynamic



Min.fert= $N_{15}P_{15}K_{15}$
Org.fert= manure
Control= - soil biota

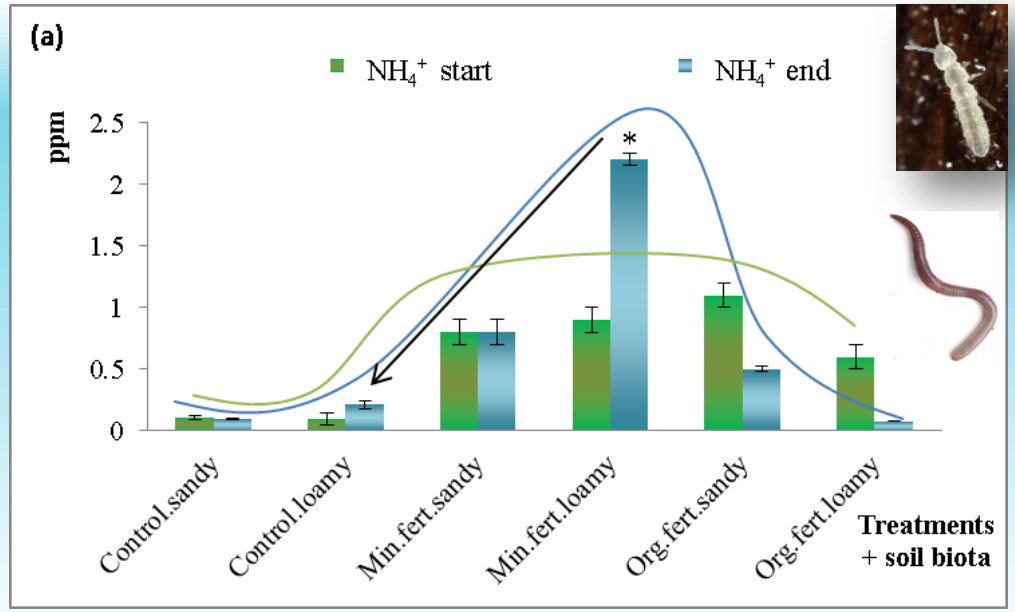
(average± SD), (*) - *p<0.05* TukeyHSD and trends (start and end of experiment)



RESULTS AND DISSCUSIONS

(a) Ammonium and (b) nitrate dynamic

Min.fert= $N_{15}P_{15}K_{15}$
Org.fert= manure
Control= + soil biota



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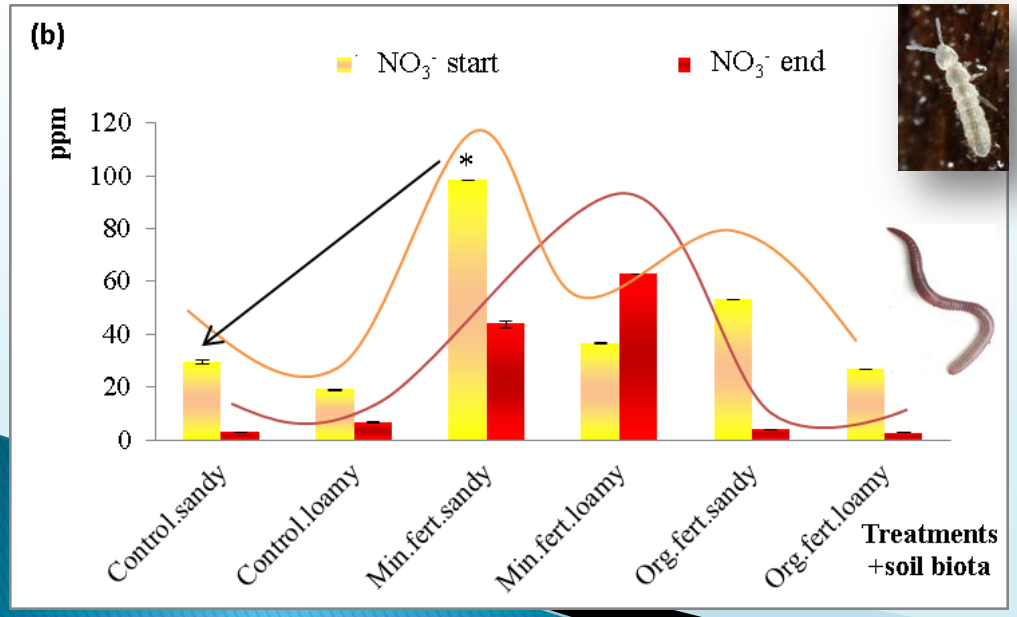

RESULTS AND DISSCUSIONS

- soil fauna

NH_4.end

Min.fert.sandy	6 x ↗	than Control.sandy
Min.fert.loamy	2 x ↗	than Control.loamy
Min.fert.sandy	2 x ↗	than Org.fert.sandy
Min.fert.loamy	4 x ↗	than Org.fert.loamy
Org.fert.sandy	3 x ↗	than Control.sandy
Org.fert.loamy	3 x ↘	than Control.loamy

NO_3.end

Min.fert.sandy	13 x ↗	than Control.sandy
Min.fert.loamy	8 x ↗	than Control.loamy
Min.fert.sandy	10 x ↗	than Org.fert.sandy
Min.fert.loamy	7 x ↗	than Org.fert.loamy
Org.fert.sandy	1 x ↗	than Control.sandy
Org.fert.loamy	1 x ↘	than Control.loamy

+ soil fauna

NH_4.end

Min.fert.sandy	8 x ↗	than Control.sandy
Min.fert.loamy	10 x ↗	than Control.loamy
Min.fert.sandy	2 x ↗	than Org.fert.sandy
Min.fert.loamy	27 x ↗	than Org.fert.loamy
Org.fert.sandy	5 x ↗	than Control.sandy
Org.fert.loamy	3 x ↘	than Control.loamy

NO_3.end

Min.fert.sandy	15 x ↗	than Control.sandy
Min.fert.loamy	9 x ↗	than Control.loamy
Min.fert.sandy	12 x ↗	than Org.fert.sandy
Min.fert.loamy	24 x ↗	than Org.fert.loamy
Org.fert.sandy	1 x ↗	than Control.sandy
Org.fert.loamy	3 x ↘	than Control.loamy

CONCLUSIONS

- Overall microcosms, ammonium and nitrate leachate was higher in sandy soil
- Higher ammonium and nitrate values were registered in the treatments with mineral fertilizer
- Presence of soil biota had a low influence on leached nitrogen

Thank you for your attention !

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