STUDY OF NITRIFICATION CAPACITY OF THE PRELUVOSOIL UNDER DIFFERENT CULTIVATION CONDITIONS AND THE RELATIONSHIPS BETWEEN NITRIFICATION PROCESS AND SOIL PROPERTIES

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Abstract
Despite its great importance in the field of agriculture and despite the intriguing question of the intermediary metabolism involved, the process of nitrification has received relatively little attention. Many organisms live in the soil. Some of these are able to change ammonium nitrogen (NH_4^+) to nitrate nitrogen (NO_3^-). Nitrification has two steps -both are carried out by bacteria that live in the soil (Nitrosomonas and Nitrobacteria). Common source of ammonium in the soil result from decaying plants and organic matter, or ammonium can come from the application of manure or nitrogen fertilizers.

Key words: soil, microorganism, nitrification.

INTRODUCTION

Nitrification depends on microorganisms. Factors such as organic matter, water content, oxygen supply, temperature and soil pH can affect the nitrification capacity of the soil. Warm, moist soils, with good oxygen supply, provide favorable conditions for nitrification. Nitrification is very active during the spring and summer months, slows in the fall, and is essentially nonexistent during the winter.

MATERIAL AND METHODS

The soil samples were collected from experimental plots field at village Cauaceu, localized at 10 kilometers from Oradea, on March 15-19.2008. The soil was collected from upper 40 cm of the agricultural preluvosoil, fruit-growing preluvosoil and control preluvosoil. In the laboratory plant material and soil macro fauna were removed and the soil samples were sieved (<2mm) and mixed. The number of total nitrifyng bacteria was determined using the dilution method. These soil samples (10 g), were suspended in 90 ml distilled water. Dilutions (of 10^{-6}) were prepared from the soil samples using distilled water and these were dispersed with a top drive macerator for 5 min. The soil samples taken from suitable dilution were planted in nourishing solution Ashby. The cells of microorganisms were counted with counting chamber and the results were evaluated as the number of microorganisms in 1 g oven-dried soil.

RESULTS AND DISCUSSION

As it can be seen, in fig.1, the nitrifying bacteria's have been identified just in inferior profile of the agricultural and fruit-growing preluvosoil. Factors such as organic matter, water content, oxygen supply, temperature and soil pH can affect the nitrification capacity of the soil. Also the nitrobacteria are affected by utilization of chemical fertilizers.

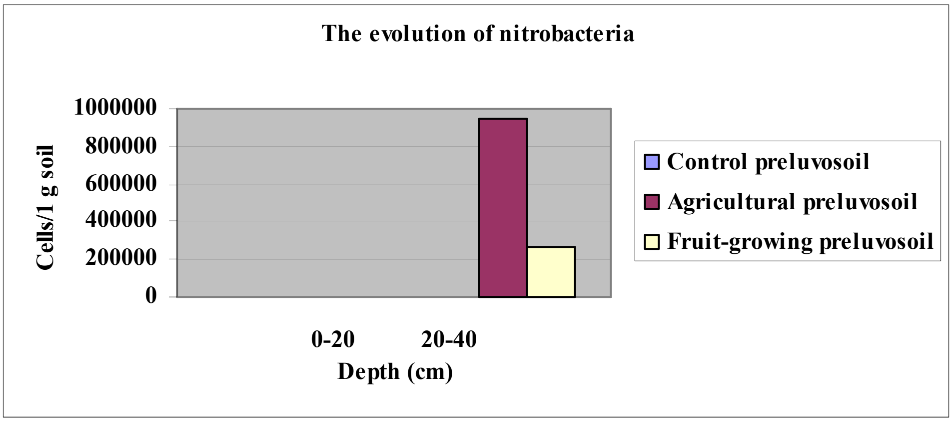

Fig. 1 The evolution of nitrobacteria

The pH value of the soil is correlated with the presence of the nitrobacteria and is an important factor which affects the nitrification rates and losses of N. Many studies have show significant relationships between soil pH and percentage of nitrification. The nitrobacteria are widely distributed in soils having a pH value of 7,3-8 (fig. 2). The value 6-6,5 of pH has inhibitory effects on the development of the nitrobacteria. The effects of soil pH on nitrification, therefore, influenced the amounts of NO_3^- lost by denitrification or leaching during spring rainfall. The observed effects of pH on nitrification rates suggest that economic and environmental benefits of delaying application of fertilizer N may be greater in higher-pH soils than in lower-pH soils.

Table 1

The pH of preluvosoil

Year	Vegetation period	Depth (cm)	Control preluvosoil	Agricultural preluvosoil	Fruit-growing preluvosoil
2008	spring	0-20	6,20	7,85	5,80
		20-40	6,25	7,88	5,75

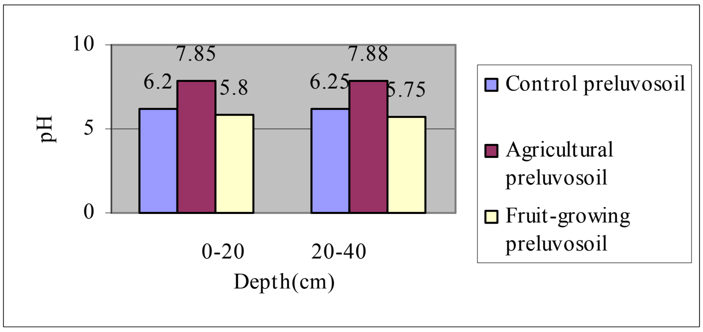

Fig. 2 The evolution of pH

Table 2

Content in N-NO_3 (ppm) of preluvosoil

Year	Vegetation period	Depth (cm)	Control preluvosoil	Agricultural preluvosoil	Fruit-growing preluvosoil
2008	spring	0-20	3,5	10,9	5,3
		20-40	3,6	11,1	4,1

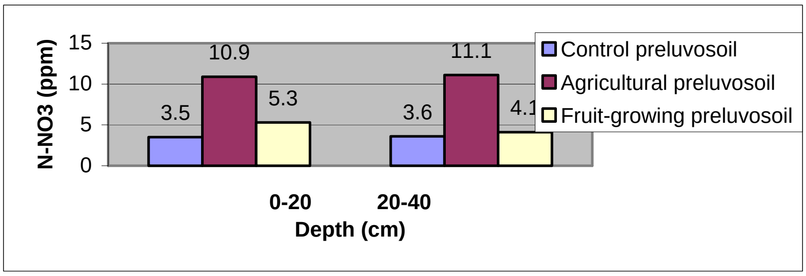

Fig. 3 The evolution of N-NO_3

As it can be seen in fig. 3 the concentration of N-NO_3 is more highly in agricultural preluvosoil which indicate that the process of nitrification is more developed in this soil.

Table 3

Content in N-NH_4 (ppm) of preluvosoil

Year	Vegetation period	Depth (cm)	Control preluvosoil	Agricultural preluvosoil	Fruit-growing preluvosoil
2008	spring	0-20	1,6	0,6	2,8
		20-40	0,2	0	1,4

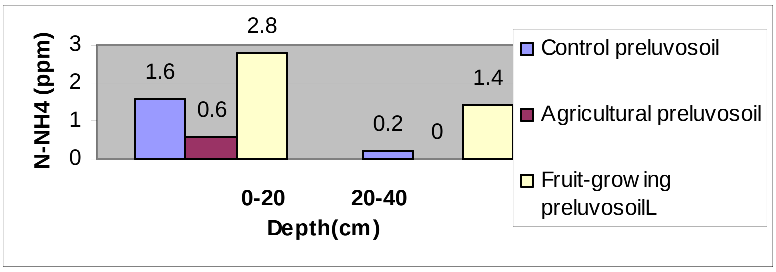

Fig. 4 The evolution of N-NH_4

The intensity of nitrification is affected by the content in ammonium. The nitrobacteria can oxidize slowly the ammonium of vegetable soil comparative with the ammonium salts. Sulphates of ammonium are very quickly converted to nitrate (NO_3^-) by the nitrobacteria. As it can be seen in fig. 4, the fruit-growing soil presents in both profile of the soil (0-20, 20-40) a highly content in N-NH_4 comparative with the agricultural and control preluvosoil.

Table 4

The content in vegetable soil of preluvosoil

Year	Vegetation period	Depth (cm)	Control preluvosoil	Agricultural preluvosoil	Fruit-growing preluvosoil
2008	Spring	0-20	1,72	2,93	1,77
		20-40	1,51	2,34	1,50

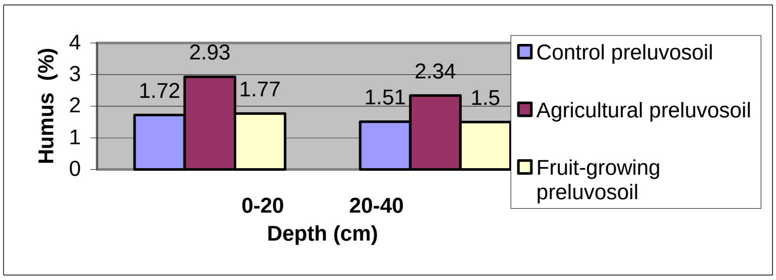

Fig. 5 The evolution of humus

The data presented in fig. 5 show that the agricultural preluvosoil is a fertile soil, rich in humus and also the nitrification is more developed comparative with the nitrification activity of fruit-growing and control preluvosoil.

Table 5

The humidity of preluvosoil

year	Vegetation period	Depth (cm)	Control preluvosoil	Agricultural preluvosoil	Fruit-growing preluvosoil
2008	Spring	0-20	14.06	18.50	16.87
		20-40	14.06	15.59	15.61

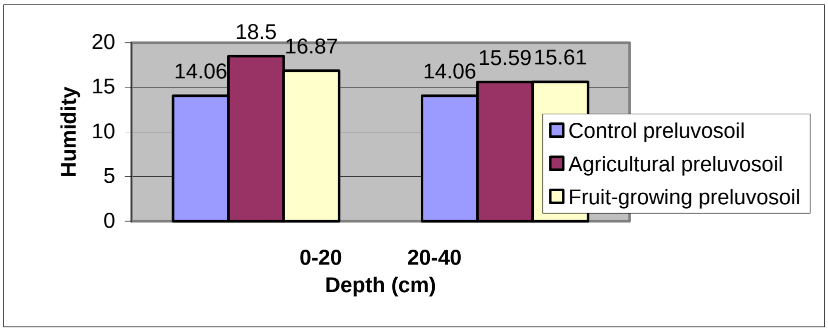

Fig. 6 The humidity of preluvosoil

The humidity of the soil is a factor which affects also the nitrification process. In fig. 6 the dates indicates that the agricultural preluvosoil, were the nitrification is active, contain a percentage of water more highly than that of the control and fruit-growing preluvosoil.

CONCLUSIONS

The anthropics action such as fertilization, treatments with pesticides, and processing of soil, can affect the chemical and physical properties of the soil and also the activity of nitrobacteria and nitrification.

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