Average	5,6	5,8	5,7

Values followed by the same letter within column are not significantly different (ANOVA, α=0,05).

Table 4: Ammonification and nitrification activity

		System		
		Ecological	integrated	average
ammonification (mg/kg)	1999	7,6	10,4	9,0
	2000	12,4	19,8	16,1
	average	10,0 a	15,1 b	12,6
nitrification (mg/kg)	1999	7,4	10,1	8,8
	2000	12,7	20,8	16,7
	average	10,1 a	15,5 b	12,8

Values followed by the same letter within lines are not significantly different (ANOVA, α=0,05).

OCCURRENCE AND DEGRADATION OF NITRATE IN SOME SOIL PROFILES IN HUNGARY

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Summary

We studied the profiles of three Fertilization Experimental Farms of Debrecen Agricultural University in Hungary. The soil samples were usually taken by drilling by 20 cm layers from 0 to 200 cm, by 25 cm from 200 to 300 and by 50 cm from 300 to 600 cm. The soil types of profiles differed basically in moisture, clay and silt and organic carbon content. The pH values in the upper layers of all soil types were slightly acidic then increased and became alkalic because of the appearance of $CaCO_3$. In the control chernozem profile the nitrate content decreased from the top to the bottom of profile. There was an accumulation detected in the control meadow soil.
The effect of fertilization can be shown clearly, because the nitrate accumulated in lower layers. As an effect of fertilization, the nitrate content increased remarkably in layers 160-350 cm and 450-600 cm of calcareous chernozem. The nitrate content was two and three times higher from 40 cm to 200 cm in the treated meadow soil, than in the control, because of the fertilization. In the upper layer of the blownsand the nitrate content was remarkable high then it decreased to 100 cm and increased again down to the bottom of the profile. Nitrate degradation - in which bacteria plaid an important role - was the most expressed in the layers of 0-40 cm in all the three soil types. It decreased with depth, but increased again in the lower layers.

Keywords: nitrate accumulation, nitrate degradation, soil profiles, effect of fertilization on nitrate content of soil.

Introduction

Presently, at a time of intensive use of chemicals in agriculture, the leaching and accumulation of fertilizers containing nitrogen represents a global hazard. Since 1990, the amount of applied fertilizers in Hungary has dramatically decreased. In spite of this fact, it is very important to focus on their ecological and environmental effects.
Increasingly more data may be found in the special literature in Hungary concerning the investigation of the spread of nitrate ion into soil profiles (HELMECZI, 1983; NÉMETH, et al. 1989; RUZSÁNYI, 1991; PEPÓ et al. 1997, PEPÓ, 2001). However, long term fertilizer experiments also provide a very good possibility for the study of leaching and accumulation of nitrate ion in different soil types (NÉMETH, 1993, 1994).
Debrecen Agricultural University joined an EC project, which partly concerned itself with the nitrate problem. The two participating departments were the Central Laboratory of the Faculty of Agronomy and the Departmant of Soil Science and Microbiology.
Our aims were
- to investigate the physical and chemical characteristics of profiles of different soil types ,
- to compare the nitrate content of fertilized and non fertilized soil profiles,
- to estimate nitrate disappearance (denitrification activity) during the degradation experiment.

In this paper, we present a portion of these results.

Material and methods

Soil samples were collected from the profiles of three experimental farms of Debrecen Agricultural: University:Debrecen-Látókép Experimental Farm (calcareous chernozem), Hajdúböszörmény Experimental Farm (meadow soil), Debrecen-Pallag Experimental Farm (blownsand / sand mantle). The soil samples were usually taken in 20 cm layers from 0 to 200 cm, by 25 cm from 200 to 300 and by 50 cm from 300 to 600 cm.

On the Debrecen-Látókép and Hajdúböszörmény Experimental Farms maize is produced intensively. Fertilization and irrigation have been applied for more than 15 and 40 years. On the Debrecen-Pallag Farm the horticultural production was carried out.
Water content of the soil was measured by weight loss after drying at 105 °C and was expressed in the proportion of dry soil. **Clay and silt**, the particles with diameter less than 0,02 mm were determined by elutriation. The **pH value** of the samples was measured using distilled water and M KCl solution. Lime content (depending on pH values) was also determined (BALLENEGGER - di GLÉRIA, 1962). **Organic carbon** was measured using SZÉKELY's method (1960). **The nitrate content** of the whole profile and the investigation on degradation were determined with sodium salicylate (FELFÖLDY, 1987).
Nitrate degradation experiment was set up, as follows. Two series of 10-10 g soil samples were measured into sterile-labelled bottles. 30 ppm nitrate solution was added to the first series, while distilled water was added to the second series. The bottles were completely filled to produce anaerobic condition. The samples were incubated at 25 °C for 28 days and nitrate was measured in the solution. Finally we calculated the nitrate disappearance.

Results

We measured some physical (moisture-, clay and silt content) and chemical (pH, $CaCO_3$, organic- and nitrate content) characteristics of layers of profiles. According to our data, the soil types of profiles and layers differed basically in moisture, clay and silt and organic carbon content. The pH values in the upper layers of all soil types were slightly acidic then increased and became alkalic because of the appearance of $CaCO_3$.
In the control **chernozem profile** the nitrate content decreased from the top to 140 cm. In the lower layers we could detect only 1-2 ppm. In the upper layers of fertilized plot the nitrate content was lower than in the control and decreased to 120 cm. In this profile the nitrate maximum was at 300 cm and from 450 cm more nitrate was present than in the control.
The productive layer of **meadow soil** had also larger nitrate content. The maximum value was detected at 120 cm in the control and it decreased gradually down to the bottom of the profile. In the fertilized profile the nitrate maximum was at 100 cm. The nitrate content was two and three times larger from 40 to 200 cm than in the control's (Table 1).
In the upper layer of the **blownsand** the nitrate content was remarkable high then it decreased to 100 cm and increased again down to the bottom of the profile.
In the chernozem control soil the nitrate dissipation decreased from the top layer, with a minimum value was at 140 cm then increased again. In the fertilized profile the tendency was similar to the control one but this value was lower. The nitrate degradation has not changed considerably in the layers of 275-600 cm.
In the control and fertilized plots of profile in the case of **meadow soil** the nitrate disappearance (Table 2) decreased from the surface. In the control it increased from 300 cm, while in the fertilized profile from 180 cm. The nitrate degradation in the majority of layers in was higher the treated meadow soil. The nitrate degradation was higher in 0-40 cm of both fertilized soil types.
In the blownsand the nitrate degradation was remarkable high in the top layers (0-40 cm). We could not detect considerable changing in the blownsand profile down to the bottom.
The nitrate degradation was the most expressed in the layers of 0-40 cm in all the three soil types. It decreased with the depth, but increased again in the lower layers.
The effect of fertilization increased the nitrate degradation first of all in the meadow soil.

Table 1Nitrate content of different soil type profiles (NO_3 mg/kg)

Layer (cm)	Calcareous chernozem (control)	Calcareous Chernozem (treated)	Meadow (control)	Meadow (treated)	Layer (cm)	Blownsand
0-20	14,9	9,8	16,8	10,7	0-30	13,2
20-40	14,9	9,6	12,8	11,7	30-50	1,0
40-60	11,2	7,0	8,3	21,6	50-70	1,8
60-80	13,3	5,0	12,1	19,8	70-100	1,1
80-100	7,1	2,2	25,2	71,9	100-130	1,6
100-120	4,7	2,4	33,5	90,7	130-160	6,2
120-140	2,5	9,9	23,8	53,9	160-190	2,9
140-160	1,7	4,3	12,4	27,7	190-215	2,5
160-180	1,1	7,0	5,9	15,7	215-240	4,7
180-200	0,9	13,1	6,1	11,2	240-290	5,7
200-225	2,4	17,6	4,9	4,4	290-350	4,5
225-250	1,6	17,3	5,4	2,7	350-400	6,0
250-275	1,4	20,0	3,4	0,2	400-450	11,5
275-300	1,5	22,9	1,5	1,3	450-500	21,4
300-350	2,2	12,2	2,9	2,6	500-550	8,9
350-400	1,0	1,9	0,3	1,3	550-600	13,0

400-450	0,2	0,6	0,2	0,2		
450-500	0,2	4,1	0,2	0,2		
500-550	0,8	5,0				
550-600	0,7	5,9				

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Table 2 Nitrate degradation in the different soil type profiles during incubation experiment (NO_3^- mg/dm^3/28 days)

Layer (cm)	Calcareous chernozem (control)	Calcareous chernozem (treated)	Meadow (control)	Meadow (treated)	Layer (cm)	Blownsand
0-20	23,27	29,01	28,29	31,21	0-30	25,91
20-40	14,97	23,98	20,09	26,47	30-50	20,47
40-60	12,40	12,47	21,75	12,50	50-70	2,02
60-80	4,37	2,04	2,16	11,83	70-100	1,85
80-100	3,25	7,40	6,73	6,39	100-130	4,24
100-120	5,71	2,04	3,97	5,27	130-160	0,86
120-140	4,71	4,44	3,24	9,58	160-190	0,43
140-160	3,59	7,65	5,35	2,08	190-215	0,65
160-180	6,96	2,04	6,65	1,86	215-240	0,13
180-200	4,76	7,15	2,29	2,63	240-290	2,16
200-225	6,83	5,31	2,21	9,93	290-350	0,43
225-250	10,50	7,22	2,21	7,60	350-400	0,26
250-275	8,51	6,78	1,66	13,90	400-450	0,26
275-300	8,12	10,67	1,17	5,78	450-500	0,56
300-350	5,79	5,49	7,34	4,06	500-550	1,47
350-400	8,10	2,09	6,64	5,78	550-600	2,07
400-450	8,90	2,17	8,46	9,24		
450-500	7,30	1,94	9,24	22,36		
500-550	6,74	2,47				
550-600	5,84	3,42				

IMPORTANCE OF *OROBANCHE* SPECIES IN AGRICULTURAL CROPS IN SLOVAKIA

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Summary

In 2000-2001, regular surveys of agricultural plants, supposed as potential hosts of *Orobanche* spp., were done in Slovakia. *Orobanche cumana* Wallr. was not found at 26 sunflower fields checked for its occurrence. Together 8 tobacco fields and 6