In conclusion it is possible to state that the approach to the wood exploitation and work management is necessary to change, because there is a danger of multiplying the damages in environment. We suppose, that the risk of contamination of the forest environment in relation with the expected utilization of wood for the energetic needs can increase in certain regions (Viglasky, 1998a,b). Using of naturally degrading oils, good technical condition of vehicles and technology discipline has to be secured with high priority in such rare and valuable localities as Biosphere Reserve Poľana is. The reparation of the statement when the contamination is the fact is because of large area of wood exploitation too serious behalf of finance, and of course, the result is not definite.

Translated by B. Kapustová

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Samešová D., Ladomerský J.: **Kontaminácia povrchovej vody a pôdy v Biosférickej rezervácii Poľana.**

Cieľom príspevku je posúdenie kontaminácie povrchovej vody a pôdy ropnými látkami v BR Poľana. Ku kontaminácii vody a pôdy došlo v súvislosti s ťažbou kalamitného dreva v r.1996-1998. Monitorovali sme vybraté toky podľa miest intenzívnej ťažby v priebehu rokov 1996-2000. Pre doplnenie monitoringu povrchovej vody sme analyzovali aj vzorky pôdy a brehových nánosov vybratých lokalít Kamenistej doliny. Ropné látky sme stanovovali ako nepolárne extrahovateľné látky spektrometrickou metódou v infračervenej oblasti pri vlnočte od 3150 cm^{-1} do 2750 cm^{-1}. Najvýraznejšie zaťaženie ropnými látkami bolo preukázané v lokalite Kamenistý potok. Celkove v roku 1996 bolo nad hranicou 0.1 $mg.l^{-1}$ 78 % vzoriek, v r.1997 to bolo 58 % a v r.1998 37 %. Výrazne sa situácia stabilizovala až v roku 2000. Ropnými látkami bola kontaminovaná aj pôda v oblasti skladov dreva, najvyššiu koncentráciu sme detekovali opäť v lokalite Kamenistého potoka. Prítomnosť ropných látok bola dokázaná tiež v brehových nánosoch vodnej nádrže Hronček.

ENVIRONMENTAL SIGNIFICANCE OF MICROORGANISMS IN THE SURFACE WATER

SOŇA JAVOREKOVÁ, JANA VJATRÁKOVÁ, DANA TANČINOVÁ

Department of Microbiology, Faculty of Biotechnology and Food Processing, Slovak Agricultural University, A.Hlinku 2, 949 76 Nitra, The Slovak Republic, e-mail: Sona.Javorekova@uniag.sk

Abstract

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Among ecologically threatened areas in Slovakia are surface waters flowing through localities without sewerage but with intensive agricultural activities. In such an area there was also the Cabaj stream, the microbiological quality of which was monitored in a period covering March 1999–February 2001. Occurrence of the monitored physiological groups of microorganisms (coliform bacteria, actinomycetes, microscopic fungi, myxobacteria, lipolytic bacteria, and amylolytic bacteria) indicated that in the experimental years, the stream was polluted by post-consumer waste, vegetable waste, as well as soil. From March 1999 till February 2000, an increased supply of particularly easy degradable organic matters from faeces was observed in the Cabaj stream, and in a period of March 2000–February 2001, there were difficult degradable organic substances in the lower part of the stream. Also, the presence of typical representatives of soil microscopic fungi confirmed the stream pollution by different soil particles.

Key words: surface water, coliform bacteria, actinomycetes, amylolytic bacteria, lipolytic bacteria, myxobacteria, micromycetes

Introduction

From the environmental point of view, the current microbiological indicators monitored according to STN 75 7221 are not appropriate for evaluating changes and quality of surface waters. Therefore, it is necessary to introduce new indicators ensuring better monitoring the water quality, which is also in conformity with the European Union's requirements. Among suitable indicators are microorganisms or their associations that record mainly changes in carbon circulation. In order to identify increased concentrations of organic substances as well as those difficult to degrade, it is good to monitor the occurrence of actinomycetes (Niemi et al., 1982), myxobacteria (Pištěková, 1989; Miklošovičová, Tržilová, 1991), microscopic fungi (Franková et al., 1998), lipolytic bacteria (Kopřivík, 1981), amylolytic bacteria, (Čerňáková, Ferienčík, 1999a,b), oil substance and chlorinated hydrocarbon utilizing bacteria (Holubec, Tržilová, 1995) and microorganisms that are capable of utilizing phenols (Lecianová, 1987).

In the present work we aimed at monitoring the surface water quality of the Cabaj stream flowing through regions with deficiently built sewerage network on one hand and intensive farming on the other one. For hygienic quality evaluation, we monitored the quantitative occurrence of coliform bacteria while new, environmentally significant groups of microorganisms, actinomycetes, microscopic fungi, myxobacteria, amylolytic and lipolytic bacteria, little used in practice, were observed for the purposes of assessing the pollution character. From the statistical point of view, we studied potential effects of a settlement (sampling place), season (month of sampling), stream water temperature, water pH, stream depth, and a sum of precipitation on occurrence of the monitored physiological groups of microorganisms.

Material and methods

Characteristic of the territory under interest

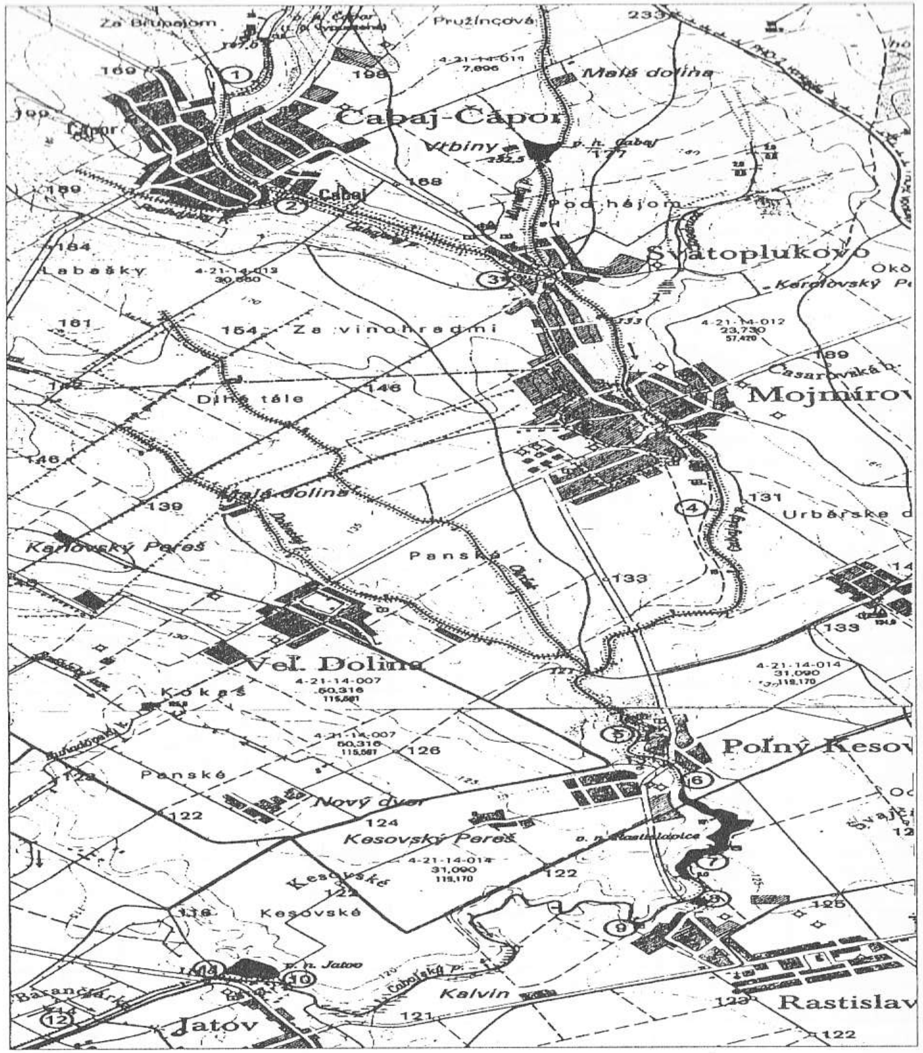
The samples were taken from the Cabaj stream, which is a left-side tributary of the Long Channel and belongs to the river Váh entrance area, and tested for the microbiological quality of water. The stream rises in a locality called Jurský Dvor. It is 29.2 km long and three water reservoirs (Cabaj, Rastislavice, Jatov) have been erected on it. The stream area under interest spreads in four cadastral territories, flowing direct through four villages, namely Cabaj-Čápor, Svätoplukovo, Mojmírovce, Poľný Kesov (Nitra district), and near the villages of Rastislavice and Jatov (Nové Zámky district). There are no differences in soil type and climate between these localities. The soils there are mostly clayey-loamy, only in the outskirts of the village of Cabaj, in a local part called "Fizes", there are sandy soils in lower beds on the left side of the stream, which are used for agricultural purposes. In other parts of the area under investigation, sandy beds are found at a 15 to 30 m depth. The longitudinal gradient of the territory is slightly slant, not mountainous, but there are valleys with a 13 % angle of slopes. Surface waters run down very fast from adjacent slopes, overflowing the valley because the stream is not capable of draining this water. As a result, the level of groundwater increases, which has the adverse effects on plants. In the last years, the stream has not been cleaned, thus becoming unsatisfactory in terms of hygiene, aesthetics and ecology.

Characteristic of intake points and samplings

Water samples were withdrawn at monthly intervals from 12 intake points (Fig. 1), from a depth of 10 cm under the water level, using 250 ml glass containers with ground joint. After being taken, all samples were processed within 24 hours. A total of 24 samplings were collected over 2 years, from March 1999 to February 2001. The values obtained were estimated, being divided in two parts: from March 1999 to February 2000 – the first experimental period (samplings 1 to 12), from March 2000 to February 2001 – the second experimental period (samplings 13 to 24).

Microbiological parameters studied

Variation-statistical parameters were calculated from the obtained counts of microorganisms (including replicates) in CFU.mL^{-1}, and the sets of values measured were tested according to the calculated value χ^2. Statistical significance of differences in the groups of microorganisms under study between intake points, samplings, as well as replicates were verified by Kruskal-Wallis variance analysis and by testing differences as described by Dunn (not shown in the tables because of length). For regression analysis and graphic representation, summary values of the occurrence of microorganisms and the average values calculated from them were used.



Scale: M=1:80 000

Fig. 1. Investigated points in the Cabaj stream.

Studied microbiological indicators

Using a plate method, we determined in three replicates the occurrence of 6 physiological groups of microorganisms in surface water samples:

- coliform bacteria (STN ISO 93 08-1-2) on Endo agar (EA) (analyses were made in 1999) and tergitol agar (TA) (since 2000)
- microscopic fungi on Czapek-Dox´s and sweet wort agars (Häusler, 1995)

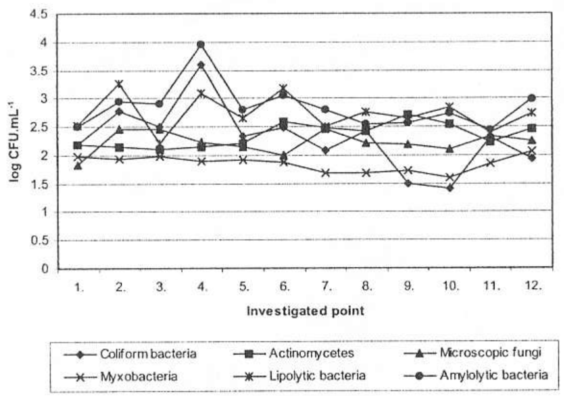


Fig. 2. Occurrence of microorganisms in the Cabaj stream from March 1999 to February 2000.

- actinomycetes on Krainsky's (KA) agar and Waksman's agar (WA) (Häusler, 1995)
- myxobacteria on champignon agare (ŠA) (Miklošovičová, 1987)
- amylolytic bacteria (Häusler, 1995)
- lipolytic bacteria (Häusler, 1995).

The quantitative analysis of coliform bacteria was carried out in compliance with STN 75 7221, actinomycetes according to Brysa (as given by Häusler, 1995), and myxobacteria according to Bernátová (1983). The identification of microscopic fungi was performed according to mycologic clues (Fassatiová, 1979; Niemi et al., 1982; Pitt, Hocking, 1997).

T a b l e 1. The basic variance-statistical characteristics and results from distribution fitting of occurrence of microorganisms (CFU.mL^{-1}) in the Cabaj stream in samplings 1-12 (the first line) and samplings 13-24 (the second line)

Statistical characteristics	Observed microorganisms					
	coliform bacteria	actino-mycetes	microscopic fungi	myxobacteria	lipolytic bacteria	amylolytic bacteria
n	423 416	426 417	426 417	410 369	426 417	419 417
x	41.95 8.80	20.78 19.88	15.16 8.97	6.26 8.80	67.08 6.89	114.87 7.01
minimal value	0 0	0 0	0 0	0 0	0 0	0 0
maximal value	2460 500	305 250	259 164	80 103	1240 145	6000 73
s	172.99 45.01	42.95 30.04	33.40 23.45	10.27 15.00	128.60 15.61	524.37 9.23
s_x	8.41 2.21	2.08 1.47	1.62 1.15	0.51 0.78	6.23 0.76	25.62 0.45
s^2	29925.80 2025.68	1844.96 902.55	1115.56 549.90	105.57 224.98	16538.30 243.74	274959.00 85.24
v %	412.37 511.70	206.71 151.10	221.86 273.66	164.04 170.46	191.73 226.68	456.50 131.76
Distribution fitting						
χ^2	765.01 1264.98	1000.56 452.42	747.48 1589.83	757.40 588.43	518.92 826.74	1191.17 522.26
P-value	0 0	0 0	0 0	0 0	0 0	0 0

n – number of obrvation, x – average, s – standard deviation, s_x – standard mean error, s^2 – variance, v – coefficient of variation, χ^2 – chí square test

Results and discussion

Of six physiological groups of microorganisms studied, amylolytic bacteria (Fig. 2) were the most numerous group in the surface water of the Cabaj stream from March 1999 till

T a b l e 2. Variance analysis occurrence of microorganisms in the Cabaj stream according to Kruskal-Wallis in samplings 1-12 (the first line) and samplings 13-24 (the second line)

Observed microorganisms	Statistical parameters					
	T-value			P-value		
	investigated point	sampling	replication	investigated point	sampling	replication
Coliform bacteria	48.21 92.82	185.28 107.60	0.08 4.30	$1.31.10^{-6++}$ $4.666.10^{-15++}$	0^{++} 0^{++}	0.86 0.12
Actinomycetes	24.25 30.42	156.48 130.56	0.84 0.42	0.012^{+} $1.36.10^{-3++}$	0^{++} 0^{++}	0.66 0.81
Microscopic fungi	9.06 18.93	218.70 151.54	1.50 3.63	0.62 0.06	0^{++} 0^{++}	0.47 0.16
Myxobacteria	20.52 31.27	166.29 38.43	0.03 2.33	0.04^{+} $9.97.10^{-4++}$	0^{++} $6.63.10^{-5++}$	0.99 0.31
Lipolytic bacteria	16.75 18.41	284.58 231.29	0.43 0.21	0.12 0.07	0^{++} 0^{++}	0.81 0.90
Amylolytic bacteria	48.55 22.03	222.53 108.47	1.07 1.08	$1.14.10^{-6++}$ 0.02^{+}	0^{++} 0^{++}	0.59 0.58

$^{++}P < 0.01$, $^{+}P < 0.05$

February 2000 (samplings 1 to 12). They made 43 % out of the total number of all occurring microorganisms, thus confirming that water in this period was polluted by easier degradable substances. Amylolytic bacteria degrade starch and lower saccharides via a system of amylase enzymes, and their presence indicated that in the water there were phytoplankton and vegetable material under degradation coming from the surrounding area. The biggest incidence of amylolytic bacteria, which is also statistically significant (Table 2), was recorded in spring, in April. Despite the fact that the mean values of amylolytic bacteria occurrence were not high (Table 1), variability of the number of amylolytic bacteria as determined for different sampling places and sample collections was quite substantial, particularly in the first period of investigation. The maximum value determined (Table 1) was higher than the value measured by Miklošovičová, Tržilová (1991) in the river Danube during sugar-beet season in 1982–1987 and is comparable to the maximum occurrence in surface standing water (Čerňáková, Ferienčík, 1999a). Sampling place 4 situated behind the villages of Mojmírovce and Svätoplukovo with the highest number of residents (Fig. 1) was found to be most loaded with the above kind of substances in this period. This influence has also been confirmed statistically significantly (Table 2).

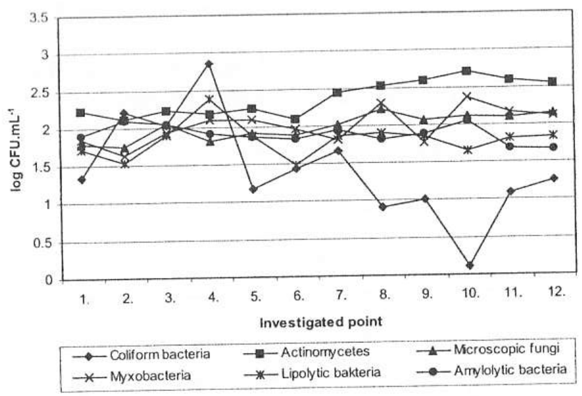


Fig. 3. Occurrence of microorganisms in the Cabaj stream from March 2000 to February 2001.

Among other factors affecting the occurrence of amylolytic bacteria were temperature (a significant degree of linear dependence) and pH in the first experimental period, and temperature and rainfalls in the second one (Table 4).

The determined contamination of the stream was of faecal character. The presence of coliform bacteria confirmed it, especially in the first period of experiment. In comparison with the running surface water of the river Danube (Miklošovičová, Tržilová, 1991), the number of coliform bacteria determined in this period was greater and could again be compared to eutrophised standing water (Čerňáková, Ferienčík, 1999b). According to STN 75 7221 (Table 5), the stream water in these sampling places had the quality of Class IV or Class V from February till August. In the second period of investigation, the water quality of the Cabaj stream was better, but sampling places 2 and 4 (Fig. 3) still belonged to the most contaminated places, both in summer and winter (June to December). It has been confirmed that a month of collecting samples as well as sampling place have a statistically significant influence.

Although the occurrence of lipolytic bacteria in the stream was considerably lower than that of coliform bacteria (Table 1), there was a significant degree of linear dependence between both groups during the whole experimental period. In the first period, lipolytic bacteria made almost 1/4 of a total of microorganisms present in the stream water. The maximum incidence of lipolytic bacteria (Figs 2,3) with statistical significance (Table 2) was recorded in sampling places 2 and 4 in July (first experimental period) and in April and September (second experimental period). But the values measured were substantially lower than those reported by Miklošovičová, Tržilová on the river Danube (1991). These sampling places also showed the greatest contamination from faeces. However, the effect of sampling places on lipolytic bacteria occurrence has not been statistically confirmed, although the meat-processing company Tauris could be a suspected causer of pollution, as its waste channel was located directly in sampling place 4. A sum of rainfall (Table 4) was found to have the most significant influence on lipolytic bacteria occurrence in the stream Cabaj (high degree of linear dependence).

The numbers of lipolytic bacteria in water biotope given below indicate a good self-cleaning capability of the stream (Kopřivík, 1981). There was a little degree of linear dependence between this physiological group and the occurrence of myxobacteria, actinomycetes and amylolytic bacteria, but only in the first experimental period (Table 3).

Occurrence of another three groups of microorganisms under study (actinomycetes, microscopic fungi, myxobacteria) was close in different sampling places, particularly in the first period, and showed no evidence of the substantial effect of farming (soil washing-off, animal excrement) on the water quality of the Cabaj stream. Sampling places had no statistically significant influence on the incidence of myxobacteria and microscopic fungi (Table 2). Though the P-value indicated myxobacteria can exert a potential, statistically signifi-

T a b l e 3. Correlation coefficients of linear dependent (Y = a+bX) between observed microorganisms in the Cabaj stream in samplings 1–12 (the first line) and samplings 13–24 (the second line)

Dependent variable	Independent variable				
	amylolytic bacteria	lipolytic bacteria	myxobacteria	microscopic fungi	actinomycetes
Coliform bacteria	-0.04782 0.37111^{+}	0.52860^{++} 0.53961^{++}	-0.46348^{+} 0.31367^{+}	0.10379 0.20002	0.041424 0.41707^{+}
Actinomycetes	-0.26504 -0.04157	-0.35995^{+} 0.08331	-0.20129 0.38308^{+}	-0.27232 -0.09562	
Microscopic fungi	-0.22127 -0.07604	0.10873 0.23991	0.18177 -0.21377		
Myxobacteria	0.03908 0.12130	-0.41193^{+} -0.22151			
Lipolytic bacteria	0.43292^{+} -0.09549				

$^{+}$ – slight degree of linear dependent, $^{++}$ – the considerable degree of linear dependent

T a b l e 4. Correlation coefficients of linear dependent (Y = a+bX) of occurrence of microorganisms (average values) with temperature of water, depth of stream, pH and precipitation, in samplings 1-12 (first line) and in samplings 13-24 (second line)

Correlation coefficients between occurrence of microorganisms with temperature of water					
r_1	r_2	r_3	r_4	r_5	r_6
0.35213^{+}	0.06294	-0.29227	-0.51435^{++}	0.62289^{++}	0.57260^{++}
0.17784	-0.35124^{+}	0.29891^{+}	-0.11785	0.36374^{+}	-0.32436^{+}
Correlation coefficients between occurrence of microorganisms with depth of stream					
0.71918^{+++}	-0.15093	-0.04944	-0.43940^{+}	0.56043^{++}	0.08834
-0.38904^{+}	0.08712	-0.26672	-0.50639^{++}	0.18107	-0.04588
Correlation coefficients between occurrence of microorganisms with pH water					
0.66248^{++}	-0.06460	-0.07822	-0.56521^{++}	0.48711^{+}	0.30093^{+}
-0.02012	-0.30845^{+}	-0.23996	0.33110^{+}	0.01665	0.07537
Correlation coefficients between occurrence of microorganisms with precipitation					
0.42722^{+}	-0.33278^{+}	0.23671	-0.66810^{++}	0.72902^{+++}	0.12566
0.24979	0.53117^{++}	-0.37677^{+}	-0.04245	0.33970^{+}	-0.36067^{+}

r_1 – coliform bacteria, r_2 – actinomycetes, r_3 – microscopic fungi, r_4 – myxobacteria, r_5 – lipolytic bacteria, r_6 – amylolytic bacteria
$^{+}$ – slight degree of linear dependent, $^{++}$ – the considerable degree of linear dependent, $^{+++}$ – the high degree of linear dependent

T a b l e 5. Quality of surface water in the Cabaj stream [%]

Observed microorganisms	Samplings 1-12					Samplings 13-24				
	class quality of surface water									
	I.	II.	III.	IV.	V.	I.	II.	III.	IV.	V.
Coliform bacteria	58.45	14.08	19.01	7.75	–	66.91	20.14	9.35	0.72	–
Actinomycetes	61.97	24.65	8.45	2.82	2.11	52.52	30.22	12.23	4.32	0.72
Myxobacteria	77.46	20.42	2.11	–	–	75.54	17.99	5.04	1.44	–

cant influence, further examination of contrasts as described by Dunn has not produced evidence of this phenomena.

Based on the incidence of actinomycetes and microscopic fungi, water quality decreased in the second half of the experimental period. In particular, it was observed in the lower part of the stream, in sampling places 7–12 (Fig. 3). There were significant differences between sampling places 6 and 10. Among sources of pollution were farmed land and cellulolytic substances (vegetable waste), which got in the stream in a period of September–December (Fig. 3) due to increased rainfalls. The statistical significance of this influence (a considerable degree of linear dependence) was confirmed in the second experimental period (Table 4). The values of actinomycetes occurrence in surface waters ranged from 0 to 305 CFU.mL^{-1}. These can be compared to the values for the river Nitra reported by Tržilová, Miklošovičová (1985). Higher occurrence values of actinomycetes were determined for the rivers Morava, Ipeľ and Danube. The values were not influenced by a month of sample collecting (temperature) but showed an increase in a supply of organic matters in surface waters (Miklošovičová, Tržilová, 1991). These authors do not even mention a potential correlation between the occurrence of actinomycete and other bacteria associations. The results from our experiments have partially confirmed this fact, because there was only a light correlation of the incidence of actinomycetes and coliform bacteria and myxobacteria in the second part of the experimental period (Table 3). In the first period, a slight linear dependence between the occurrence of actinomycetes and lipolytic bacteria was detected.

Important changes in the environmental conditions also influence the life cycle and proliferation of microscopic fungi. In the first part of the experimental period, the occurrence of microscopic fungi in the Cabaj stream was 15.16±33.40 CFU.mL^{-1} whereas it reduced to 8.97±23.45 CFU.mL^{-1} in the second part. These values are comparable with those measured in the river Danube in 1994–1998 (Tóthová, 1999), and substantially higher in comparison with the eutrophised lake (Čerňáková, Ferienčík, 1999b). Microscopic fungi occurrence was statistically significantly influenced only by months of collecting samples (Table 2). There was no correlation of the occurrence of microscopic fungi and that of other microorganism groups being studied (Table 3). Temperature and rainfalls (Table 4) had a statistically non-significant impact on this occurrence (a light degree of linear dependence). As to soil microscopic fungi, we identified 31 taxons of microscopic fungi in water samples, their genus representation being similar to that one which Tóthova noted for the river Danube (Tóthová, 1999). However,

T a b l e 6. The most common genera (in % from all saples with microscopic fungi identification)

Genus	Samplings	
	1-12	13-24
Aspergillus	71.35	70.67
Cladosporium	1.73	2.87
Fusarium	0.59	0.22
Humicola	4.46	0.06
Penicillium	18.11	21.40
Rhizopus	0.35	0.08
Trichoderma	2.10	3.40
Other genera	1.18	0.24
Non sporulated mycelia	0.13	0.11

species representation and percentage frequency of individual genera and species were different. In our samples, the most frequent soil microscopic fungi genera were *Aspergillus, Penicillium, Humicola, Cladosporium,* and *Trichoderma* (Table 6). In particular, fungi of the genus *Aspergillus* were substantially prevailing during the whole experimental period. From the hygienic and toxicological aspects, the undesired species *Aspergillus flavus, A. fumigatus, A. niger, A. ochraceus, A. clavatus* and *Aureobasidium pullulans* were found in the stream water. No oil substances were found to cause contamination of the Cabaj stream surface water. A low occurrence of representatives of the genus *Cladosporium* has confirmed this finding (Tóthová et al., 2001). In comparison with Franková (1993) we revealed a considerably lower percentage frequency of representatives of the genus *Fusarium*.

No substantial contamination of the Cabaj stream was detected due to agricultural activities (digestive tract of herbivores, fertilized land, silage juices). The determined number of myxobacteria was low and did not substantially exceed the limit value of 30 CFU.mL^{-1} for contaminated waters. In the Cabaj stream surface water there were lower numbers of myxobacteria than in the river Danube (Miklošovičová, Tržilová, 1991). Based on myxobacteria occurrence, the Cabaj stream water was of Class I or II quality (95 % of samples). The greatest occurrence of myxobacteria was observed in the lower part of the stream (sampling places 8 and 10) in August and September. Statistically processed values showed that there is a correlation (light degree) between the myxobacteria and coliform bacteria occurrences, admitted also by Pištěková (1989). The incidence of myxobacteria was dependent (significant degree of linear dependence) upon temperature, pH and rainfalls in the first experimental period and only on a depth of the stream in the second period (Table 4).

Translated by M. Hušeková

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Javoreková S., Vjatráková J., Tančinová D.: **Ekologický význam mikroorganizmov v povrchovej vode.**

Medzi ekologicky ohrozené oblasti na Slovensku patria povrchové vody pretekajúce obcami bez kanalizácie a s intenzívnou poľnohospodárskou činnosťou. V takejto oblasti sa nachádzal i Cabajský potok, ktorého mikrobiologickú kvalitu sme monitorovali v období od marca 1999 do februára 2001. Výskyt sledovaných fyziologických skupín mikroorganizmov (koliformných baktérií, aktinomycét, mikroskopických húb, myxobaktérií, lipolytických baktérií a amylolytických baktérií) nám potvrdil, že potok bol v sledovanom období zaťažovaný odpadmi komunálneho pôvodu, rastlinným opadom a pôdou. V období od marca 1999 do februára 2000 sme v Cabajskom potoku zaznamenali najmä zvýšený prísun ľahšie rozložiteľných organických látok fekálneho pôvodu a v období od marca 2000 do februára 2001 v dolnej časti potoka prítomnosť ťažšie rozložiteľných organických látok. Znečistenie potoka pôdnymi časticami nám potvrdila i prítomnosť typických zástupcov pôdnych mikroskopických húb.

SELECTED AGROCHEMICAL SOIL PARAMETERS EVALUATION FROM THE VIEW OF ITS PRODUCTIONAL FUNCTION

BOŽENA PECHOVÁ, DUŠAN MIKLOVIČ, RADOSLAV BUJNOVSKÝ

Soil Science and Conservation Research Institute, Gagarinova 10, 82713 Bratislava, The Slovak Republic, e-mail: pechova@vupu.sk

Abstract

Pechová B., Miklovič D., Bujnovský R.: Selected agrochemical soil parameters evaluation from the view of its productional function. Ekológia (Bratislava), Vol. 22, No. 2, 211–218, 2003.

In period 1999–2001 we have balanced yield forming potential of texturally medium heavy soils of Slovakia within the partial task "Soil nutrient potential in relationship to yield formation and fertilization strategy". We have ascertained, most of medium heavy Haplic Chernozems calcaric, Mollic Fluvisols calcaric has been permanently keeping high fertility potential from the view of soil reaction, humus amount and quantity, and nutritional offer. To fertile soils can be included also some Luvi-haplic Chernozems, Mollic Fluvisols, Eutric Fluvisols, Calcaric Fluvisols, and Haplic Luvisols, particularly at higher N, P, K nutrients levels. Less fertile Eutric Cambisols, Dystric Planosols and Albic Luvisols. Statistically significant correlations among soil parameters, i.e.soil reaction, humus, humus quality (HA:FA, C:N), total nitrogen, available phosphorus and potassium are materialized assessment of yield bringing soil potencial.

Key words: soil reaction, humus, humus quality, nitrogen, phosphorus, potassium

Introduction

Mankind has been and in next future will be existentially associated with soil that is securing plant biomass production, and contemporarily is introducing a space for its activities.

By cultivatory or anthropogenic measures soil properties have been continuously qualitatively changing. Soil quality can be judged with various aspects, besides production is established ecological assessment requirement, or environmental point of view, as soil quality is also demonstrated by its capability to secure ecological functions at concrete land use.

Agrochemical soil parameters, particularly for plant available nutrient levels, introduce summarized factor, which by nutrient of fertilizers applied assistance is significantly participating at soil productivity potential formation (Bujnovský et al., 2002; Fecenko, Ložek,