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Lixisols and Acrisols on the territory of Strandzha Mountain

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Abstract

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The main aim was to conduct a pilot study of diagnostic characteristics of soils on the territory of the Strandzha mountain and their classification according to WRB requirements (2006, 2007), including microbiological activity in stands with different tree composition. A total of seven soil profiles were studied. Soil and litter samples were collected from territories where it was previously known that the soils were with a clay – enriched subsoil (defined as Luvisols, Alisols and Zheltozem-podzolic soils). Soil classification indicators have been investigated according to the requirements of World Reference Base for soil resources. Five of the soil profiles were classified as Lixisols and two as Acrisols. On the second taxonomy level for Lixisols applied prefix qualifier – *haplic* and suffix qualifier – *hypereutric*. For Acrisols applied prefix qualifier *haplic*. Lixisols and Acrisols were established on the territory of Strandzha Mountain for the first time in oak and beech stands. Analysis of the heterotrophic microflora's total number and the structure of the microbial communities of two soil profiles was carried out. The different tree species and the period of litterfall affect the number of microbocenosis and the distribution of microbial groups in it. In the beech stand (*Fagus orientalis* Lipsky), the processes of enhanced transformation of easily degradable soil organic matter (SOM) predominated, compared to oak stand (*Quercus frainetto* Ten. and *Quercus petraea* Liebl,) where more advanced processes of transformation of SOM were observed.

Keywords: Lixisols; Acrisols; soil classification; *argic* horizon; oak stands; soil microflora

Introduction

Lixisols were defined by FAO (2001) as highly weathered soils in which the clay was washed from the eluvial *E* horizon (L. Lixivia – washed substance) in depth to the *argic* horizon. It had low clay activity and moderate to high saturation with bases, with a cation exchange capacity of less than 24 cmol(+).kg^{-1}. These soils are mainly distributed in tropical, subtropical or warm temperate climates with a clearly dry season. They are formed on old eroded terrains formed during the Pleistocene or older deposits (WRB, 1998). According to WRB (2006, 2007), Lixisols are soils that fall into group 9 of soils enriched with clay subsoils, along with 4 other soil types – Albeluvisols, Alisols, Acrisols and Luvisols.

According to Ebelhar et al., 2008, these soils were known as red and yellow soil.

Lixisols have also been found in Europe. These soils were described in the studies of Costantini et. al. (2013) for Italy and Dengiz et al. (2017) for the territory of Turkey. For this type of soil Hartmann et al. (2014) found that it is formed on granite, and not only on the well-known erosion terraces and old deposits.

For the time being, in the Bulgarian literature there are rather indicative data on the distribution of Lixisols. Of the group of texture differentiated clay-rich soils in the Strandzha Mountain, it was known that the largest areas were occupied by the Luvisols. They were described by Tanov, 1956; Antipov-Karataev et al., 1960, Koynov et al., 1968, 1998; Penkov et al., 1992 and others. Ninov (1997, 2002, 2005) in addition to the Luvisols on the territory of Strandzha also described Planosols, Rankers, Lithosols, Fluvisols, Gleysols Arenosols, Rankers, Rendzinas and Nitisols. Kirilov‘s (2013) research described also and Arenosols along the Bulgarian part of the Black Sea Coast.

Zheltozem podzolic soils have been described as unique soils for the country and the Balkan Peninsula in Strandzha mountain region (Tanov, 1956; Antipov-Karataev et al., 1960; Yolevski and Hadzhiyanakiev, 1976; Koynov et al., 1968, 1998; Penkov et al., 1992). They were pointed out in the group of texture differentiated clay-enriched soils and in the country‘s Basic soil classification were defined as *Ultic* Luvisols (Penkov et al., 1992). They were later identified as Alisols (Ninov, 1997, 2002, 2005; Teoharov, 2009). Shishkov and Kolev (2014) described them as Zheltozem soils that correlate/referred to Acrisols according to WRB (2006). According to Jordanova (2017), the discussion on the correct correlation of these soils in accordance with the diagnostic characteristics indicated in WRB (2006, 2007) with soils listed in the National Soil Classification of Bulgaria is still ongoing.

It can be assumed that there is still no conclusive evidence for the presence of Alisols in Bulgaria, mainly due to the lack of analytical data determined according to WRB requirements (2006, 2007). The studies mentioned above were based on a texture, which was determined by the Kachinski (1965) method for the fine earth with a particle size of less than 1 mm and a cation exchange capacity, determined in pH 8.2 extract (Ganev, 1980). For their exact definition it is necessary to analyze the diagnostic criteria using the recommended analytical procedures for soil characterization according to WRB (2006, 2007).

The main aim was to conduct a pilot study of diagnostic characteristics of soils on the territory of the Strandzha mountain and their classification according to WRB requirements (2006, 2007), including microbiological activity in stands with different tree composition.

Materials and Methods

The territory of Strandzha Mountain falls in the Mediterranean soil area, Balkan-Apennine soil area, Strandzha province (Koleva-Lizama, 2006). In the northern part of the mountain and near the Black Sea are distributed Planosols (acidic pseudopodzolic soils), Luvisols (Cinnamon forest soils), Rankers and Lithosols. Fluvisols (acidic Deluvial soils), Gleysols (Swamp soils), Arenosols (Sandy soils) are found in small areas. In the area of the ridge of Bosnia, there are Luvisols (cinnamon forest soils), Rankers, Rendzinas (humus-carbonate soils), Planosols (acidic pseudopodzolic soils), Nitisols (red soils). Alisols (yellow earths) are also found on the silicate terrains along the river valleys of Rezovska and Veleka (Ninov, 1997, 2002). Cinnamon forest soils are most widespread. These include *albic* and *hromic*. Albic have the features of a typical light eluvial surface horizon, poor in clay and iron. Chromic are darker in color, especially the illuvial horizon, which is strongly brown to red.

The Zheltozems soils from the territory of Strandzha are considered unique soils in the country and on the Balkan Peninsula. They have specific characteristics such as high acidity, high texture coefficient, low cation exchange capacity, etc. The area of Strandzha has a high percentage of forest cover, which is why the main use of soils is forestry. The forest vegetation effect of the soils in the central part of the mountain is higher than in the other parts of the mountain. It is determined by lower evaporation, more efficient use of soil moisture and higher rainfall, especially during the autumn-winter period (Nikolov, 1976). In these areas mixed oak stands, oriental beech stands, black pine plantations, etc. predominate.

Soils from the peripheral part of the Strandzha have the largest water deficit. The soil depth is of great importance for the forest vegetation effect. At 58.7% of the area they are up to 60 cm deep and 27.6% below 60 cm. Studies on moisture reserves show that the soils with a thickness of 100-120 cm and medium to heavy sandy-clay texture had good moisture storage.

A favorable prerequisite for the area was the intensity and depth of the weathered processes, which in some areas enable the soil depth of the active soil profile to be increased by accumulating moisture.

The chemical composition of soils in Strandzha has been monitored by the Forest Ecosystem Monitoring Network, which has been operational since 1986. At this stage, data for a 10-year observation period (Pavlova et al., 2000) and for a 20-year observation period have been published and summarized (Pavlova et al., 2006). The studies were focused mainly on Cinnamon forest soils, which were characterized by acid soil reaction and high content of lead, copper and cadmium in the litter and in the mineral part of the soil.

In this study, for the purpose of conducting field surveys and soil classification, according to the requirements of WRB (2006, 2007), territories were selected in which, according to the Soil Map of Bulgaria (Koinov, 1968), they were occupied by Zheltozem-podzolic soils and Cinnamon forest soils. The following parameters were analyzed: soil texture – (ISO 11277); cation exchange capacity (determined as a sum of the basic cations and the exchangeable acidity); pH_{H2O} (ISO 10390); pH_{CaCl2} (ISO 10390), Organic carbon – Modified Turin’s method (Kononova., 1963; Filcheva and Tsadilas, 2002). Microbiological assays were performed by inoculation on elective solid culture media and subsequent enumeration of germinated colonies (Davis et al., 2005; Küsel et al., 1999;

Parks & Ronald, 1997). The measurement was carried out in CFU lg/DM soil. Microbiological analyzes included the determination of bacilli and non-spore-forming bacteria, micromycetes and actinomycetes. PCR analysis of one bacterial strain in *A* horizon of soils in oak stand (*Quercus frainetto* Ten. and *Quercus petraea* Liebl.) and oriental beech stand (*Fagus orientalis* Lipsky) was performed.

Results

A total of 7 soil profiles were studied. In all of them was established an *argic* diagnostic horizon. The cation exchange capacity of this horizon was less than 24 cmol (+).kg^{-1} and the texture differentiation varied between 1.2 and 2.2 (Table 1). In five of the soil profiles the soil was saturated with bases and in two of the soil profiles the soil was not saturated. According to the diagnostic criteria of the group Soils with a clay – enriched subsoil WRB (2006, 2007) the saturated soils can be classified as Lixisols and the unsaturated as Acrisols.

All the studied profiles (Lixisols and Acrisols) occupy flat and slanting areas in Strandzha Mountain. Most of them were developed on alkaline sedimentary rocks – shales (profiles 1, 2, and 4), sandstones (profiles 3 and 7), and carbonate materials (profile 5) soil-forming rocks. An exception was profile 6, where the rock was medium acidic silicate (andesite). A litter was formed on six of the seventh soil profiles and it was made of one layer *LF* with 2 cm depth. The organic layers were mainly composed of leaves, twigs and oak fruits (*Quercus frainetto* Ten*., Quercus petraea Liebl., Quercus cerris* L*., Quercus pubescens* Willd.) and from other tree species (*Fraxinus ornus* L., *Carpinus orientalis* Mill., *Sorbus domestica* L.). Only for profile 3 the litter fall was consisted entirely of leaves, twigs and fruits of one tree specimen – *Fagus orientalis* Lipsky, which is specific for Strandzha mountain region. The litter was defined as *mull* type according to its morphological features. The soil surface horizon varied in depth from 5 cm up to 35 cm (Table 2). The transition to *Bt* horizon was clear. The soil was strongly compacted in the *Bt* horizon which defines the morphological features of the *argic* diagnostic horizon. The soil structure was assessed as week, predominantly granular or massive.

The *argic* diagnostic horizon was confirmed by the results of the laboratory analysis for all the required parameters. Its texture was finer than loamy sand and met the requirement of WRB (2006, 2007). In profiles 1 and 2 it was assessed as clay loam. For profiles 3, 5 and 6 it was clay. The soil texture in *argic* horizon for profiles 4 and 7 was loam. The clay content of the fine earth in all profiles was higher than 8%. The depth of the *argic* horizon was more than 15 cm and more than 1/10 of the sum of the thicknesses of all the overlaying horizons.

Table 1. Soil texture

Soil profiles in different suburban and rural areas	Horizon	Clay < 0.002 mm	Silt 0.063 – 0.002 mm	Sand 2.0 – 0.063 mm
		%		
Profile 1 Gramatikovo 695	A	25	43	32
	Bt	30	41	29
Profile 2 Gramatikovo 618	A	31	37	32
	Bt	38	34	28
Profile 3 Kosti	A	25	51	24
	Bt	45	34	22
	C	39	36	25
Profile 4 Vizitsa	A	19	59	22
	Bt	26	37	37
	C	23	30	47
Profile 5 Kiten	A	28	49	24
	Bt	60	26	14
Profile 6 Primorsko	A	26	41	33
	B	24	28	48
	Bt	53	14	33
Profile 7 Slivovo	A	20	44	36
	Bt	24	45	32

Texture differentiation has had almost the same manifestation in the profiles. The *argic* diagnostic horizon was morphologically homogeneous in six of the soil profiles. The only exception was profile 6, in which the *argic* horizon was formed at the lower part of the *B* horizon. As soil depth increased, sand and silt fractions of soil texture were predominant. For the surface soil horizon these fractions were in the range of 69% – 81% which are carriers of primary minerals in the soil and mostly of quartz. In *Bt* horizon they varied between 40% and 76%.

The reaction (pH $_{H2O}$) of the litter varied from very highly acidic (4.9 – profile 3) to slightly acidic (6.3 – profile 2). In the surface soil horizon, the soil reaction (pH $_{H_2O}$) was very highly acidic in profiles 5 and 6, highly acidic in profile 3, and medium acidic in profiles 1, 2, 4 and 7 (Table 2).

For the *argic* horizon pH $_{H2O}$ in profiles 5 and 6 it increased with 0.3-0.4 pH units or remained the same (profiles 3 and 7). In profiles 1, 2 and 3 pH $_{H2O}$ decreased with 0.1-0.3 pH units. In most of the cases pH $_{H2O}$ increased or remained the same in soil depth. In 57% of the studied profiles the pH $_{H2O}$ in *argic* horizon was in the range 5.2-6.0, which was an indicator of destructive changes in the soil (Ganev, 1990). For the other 43 % of the cases, the pH $_{H2O}$ in *argic* horizon was in the range 4.8-5.2, which meant that conditions for plant nutrition uptake were unfavorable. The pH $_{H2O}$ usually increased in soil depth of the profiles, and this was related to more significant influ-

Table 2 Soil parameters – pH_{H_2O}, pH_{CaCl_2}, Exch. Acidity, Exch. basic cations, Cation exchange capacity (CEC), Base saturation (BS), Org. C and Total N

Soil profiles in different suburban and rural areas	Horizon	Soil depth	pH	pH	Exch. acidity	Exch. Ca	Exch. Mg	Exch. K	Exch. Na	CEC	BS	Org. C	Total N
		cm	H_2O	$CaCl_2$		cmol(+).kg^{-1}					%	g.kg^{-1}	
Profile 1 Gramatikovo	LF	2-0	5.7	5.1	5.32	52.60	9.30	1.27	0.24	69	92	283.60	12.25
	A	0-11	5.5	4.7	0.78	2.55	1.67	0.22	0.27	5	86	38.00	2.03
	Bt	11-60	5.4	4.3	1.31	2.54	2.38	0.15	0.04	6	80	16.50	0.97
Profile 2 Gramatikovo	LF	2-0	6.2	5.5	2.36	50.00	6.27	0.22	0.28	59	96	285.30	16.14
	A	0-6	5.3	4.2	1.92	1.58	1.47	0.01	0.25	5	63	27.90	1.34
	Bt	6-51	5.2	3.7	6.22	0.85	0.44	0.03	0.03	8	18	10.10	0.80
Profile 3 Kosti	LF	1-0	4.9	4.6	4.85	61.05	8.97	1.84	0.24	77	94	299.50	18.21
	A	0-10	4.8	3.6	1.65	12.25	5.84	0.28	0.28	20	92	35.20	3.00
	Bt	10-60	4.8	4.3	5.53	8.02	3.91	0.01	0.00	17	68	14.90	1.73
Profile 4 Vizitsa	LF	2-0	5.6	5.5	0.33	20.70	3.51	0.38	0.38	25	99	248.00	16.62
	A	0-5	5.8	5.3	0.65	7.77	1.55	0.11	0.11	10	94	17.20	2.33
	Bt	5-52	5.5	5.4	0.65	5.54	1.20	0.09	0.09	8	91	8.80	1.52
Profile 5 Kiten	LF	2-0	5.8	5.5	0.63	58.91	11.70	0.41	0.25	72	99	299.81	19.07
	A	0-20	4.5	3.9	6.37	1.50	1.61	0.02	0.00	10	33	22.31	1.14
	Bt	20-38	4.9	4.2	4.43	11.28	7.04	0.03	0.43	23	81	7.68	0.67
Profile 6 Primorsko	A	0-5	4.7	3.9	7.48	8.09	3.00	0.44	0.44	19	62	89.60	8.56
	B	5-22	4.9	3.9	1.39	0.81	0.74	0.06	0.06	3	55	4.40	0.46
	Bt	22-75	5.1	3.9	8.76	4.55	3.31	0.14	0.14	17	48	2.00	0.35
Profile 7 Slivovo	LF	2-0	6.3	5.7	2.05	25.61	7.33	3.03	0.36	38	95	240.09	15.09
	A	0-35	6.0	5.0	0.56	5.86	1.62	0.12	0.12	8	93	12.10	3.19
	Bt	35-100	6.0	4.9	0.41	3.40	2.10	0.09	0.09	6	93	5.30	1.11

ence of soil-forming rocks, which are one of the main sources of basic cations. Leaching process was established in some of the soil profiles and the basic cations were removed in the soil depth. The exchangeable acidity (pH_{CaCl2}) was estimated by the Ulrich scale (1983). It showed that the buffer capacity of the soil in profiles 2, 3, 5 and 6 was achieved by the weathering of secondary silicates and the release of exchangeable aluminium. In profiles 1 and 7 the leading buffer process was the exchange of protons with basic cations – Ca^{2+} and Mg^{2+} and for profile 4 – the weathering of the primary silicates.

The litter was saturated with bases from 92% up to 99% due to the high content of exchangeable calcium in it. The distribution of exchangeable calcium in the soil horizons was normal. A certain accumulation of exch. Ca was observed in the *argic* horizon for profiles 5 and 6, where occur a leaching process.

The sum of the basic cations in *A* horizon had an average values for profiles 1, 2 and 5. In profiles 4 and 7 it was high and for profiles 3 and 6 – very high (Vanmechelen scale, 1997). The *argic* diagnostic horizon was characterized by a high (5.11 cmol (+).kg^{-1}) to very high (19.78 cmol (+).kg^{-1}) values of the sum of basic cations. Only in profile 2 it was low (1.35 cmol (+).kg^{-1}), where acid cations predominated.

The exch. Ca / exch. Mg ratio naturally decreased in soil depth in most of the studied profiles. Profiles 4 and 6 showed biogenic accumulation of calcium in the *A* horizon, while in profiles 2 and 5 – it was established in the *Bt* horizon. It was shown in Figure 1.

The content of organic carbon in *LF* layers of the litter was assessed as low. It varied between 240 g.kg^{-1} and 299 g.kg^{-1}. Highest values were established in the surface horizon up to

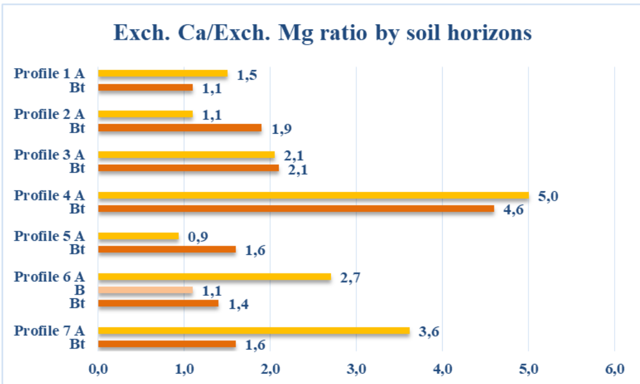

Fig. 1. Exch. Ca / exch. Mg ratio in soil profiles by soil horizons

38.0 g.kg^{-1} in profile 1. It was medium for profiles 1, 2, 3 and 5, low for profiles 4 and 7, and very low in profile 6. In *Bt* horizon the content of Org. C was low and very low (Vanmechelen scale, 1997).

The total N in the litter varied significantly from low (12.25 g.kg^{-1} in profile 1) to high (19.07 g.kg^{-1} in profile 5). In *A* horizon it was medium for most of the profiles (1, 2, 4 and 5). In profiles 3 and 7 it was high, and very high (8.56 g.kg^{-1}) for profile 6. In depth of profiles, its values naturally decreased. The *argic* horizon was characterized by low (profiles 1, 2 and 5) and medium values (profiles 3, 4 and 7), except profile 6, where its content was very low (0.35 g.kg^{-1}) (Vanmechelen scale, 1997).

The org.C/N ratio in the litter was very low and low. These values were a prerequisite for the relatively rapid transformation of organic matter. In *A* horizon it was very low (profiles 3, 4, 6 and 7) to low (profiles 1, 2 and 5). In soil depth its values decreased and in *argic* horizon they were very low in all the profiles, except in profile 1 – where they were low (Vanmechelen scale, 1997).

The highest values of cation exchange capacity for the surface horizon were established in profile 3 (20 cmol (+).kg^{-1}) and the lowest in profiles 1 and 2 (5 cmol (+).kg^{-1}). It was similar in depth for the *argic* horizon. The values varied between 6 cmol (+).kg^{-1} and 23 cmol (+).kg^{-1}. An exception was profile 5, where it sharply increased from 10 cmol (+).kg^{-1} up to 23 cmol (+).kg^{-1}.

By applying the WRB diagnostic criteria (2006, 2007) profiles 1, 3, 4, 5 and 7 were classified as Lixisols. Morphologically they were very similar to Acrisols (profiles 2 and 6) and on the field they couldn't be distinguished. The texture coefficient in Lixisols varied between 1.2 and 2.1. For Acrisols it was 1.2 (profile 2) and 2.2 (profile 5) (Table 1). The migration of clay was clearly expressed, especially in *Bt* horizons. Cation exchange capacity was also similar to Acrisols, it was lower than 24 cmol (+). kg $^{-1}$ (Table 2).

Argic diagnostic horizon in Lixisols soil profiles was saturated with bases from 68 % up to 93%. This is the main difference between them and Acrisols. In the WRB classification (2006, 2007) Lixisols were classified as a separate soil unit in the group of Soils with a clay – enriched subsoil. On the second taxonomy level for all Lixisols (profiles 1, 3, 4, 5 and 7) applied prefix qualifier *haplic*. It was established that suffix qualifier *hypereutric* applied for all of them, because in some part of the soil the base saturation was 80 % or more. The soils in profiles 2 and 6 were assessed as Acrisols and for them applied prefix qualifier *haplic.*

In Table 3 were shown the established microbiological parameters of the studied Haplic Lixisols (lg CFU g / DM soil).

The data obtained showed that soil biogenicity decreases in soil depth of both profiles. This decrease of the total microbial number was associated with a decrease in the content of Org. C and a deterioration of the air regime in the depth of the soil. The positive relationship between the number of microorganisms and the content of Org. C has been proven by the value of the correlation coefficient r = 0.87 (Figure 2)

The established total microbial number in *A* horizon of the soil in beech stand (profile 3) was 5.3 times higher than that in oak stand (profile 5). This was due to the higher content of Org.C in profile 3 and more favourable Org.C / N ratio. Higher biogenicity was also reported in the *Bt* horizon – 2.6 times. This was because the leaves in the oak stands fall in the spring of the next year. By that time, the leaves of oriental beech had already fallen off the previous autumn and organic transforma-

Table 3. Microbiological parameters – Total microbial number and different groups of microorganisms in the soil profiles

Soil profile	Forest stand	Soil horizon	Soil depth (cm)	Total microbial number	Bacillus	Non-spore forming bacteria	Micromycetes	Actinomycetes
Profile 3	*Fagus orientalis* Lipsky	A	0-20	3.24 ± 0.51	3.07 ± 0.28	2.55 ± 0.68	2.10 ± 0.09	2.02 ± 0.02
		Bt	20-38	3.07 ± 0.29	2.86 ± 0.21	2.37 ± 0.58	1.93 ± 1.36	2.10 ± 0.55
Profile5	*Quercus frainetto* Ten. and *Quercus petraea* Liebl.	A	0-10	3.97 ± 0.51	3.47 ± 0.28	3.52 ± 0.68	1.97 ± 0.09	2.05 ± 0.02
		Bt	10-60	3.48 ± 0.29	3.16 ± 0.21	3.19 ± 0.58	0.00 ± 1.36	1.32 ± 0.55

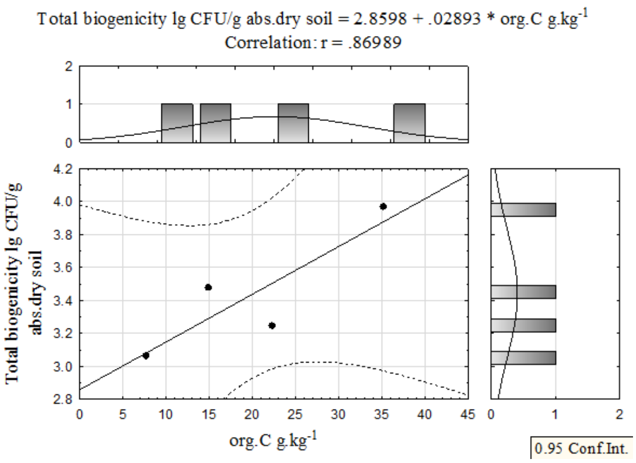

Fig. 2. Relationship between the change in the amount of Org. C (g.kg^{-1}) and the total biogenicity (lg CFU g/DM soil)

tion processes had begun in them.

The results of the microbiological analyzes indicated also a different relative distribution of the microbial groups in the studied profiles, which are shown in Figure 3.

In *A* horizon of profile 5 (oak stand) the predominant bacterial group was the bacillus, which was involved in the decomposition of more complex organic components. The high percentage of bacilli meant that the transformation of soil organic matter (SOM) was in a more advanced stage. In profile 3 (oriental beech stand) were observed processes of accelerated transformation of easily degradable SOM, due to the high percentage of non-spore-forming bacteria responsible for the initial stages of organic degradation.

In the depth of soil in oak stand (profile 5), the mineralization of SOM was proceeding actively. Given the relatively low percentage of bacilli in the *Bt* horizon of profile 3, it can be concluded that some decrease in the rate of deep mineralization of

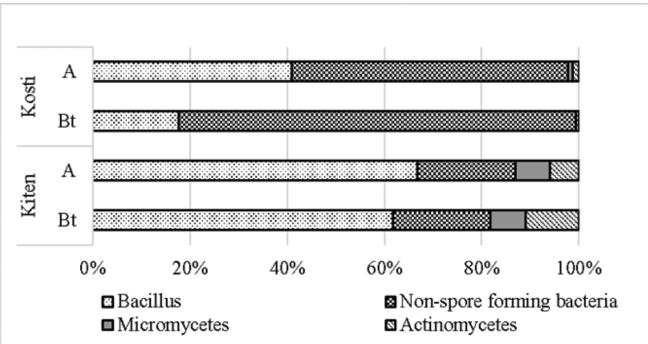

Fig. 3. Percentage participation of microbial groups

SOM is possible. By PCR analysis, the isolated strain from soil in oak stand (profile 5) was 96% similar to *Bacillus megaterium*, which was an indicator of enhanced amination processes in this soil. The strain of the soil in oriental beech stand (profile 3) corresponded to 99% of the *Pseudomonas stutzeri* species. In the studied profile it was specific that this bacteria strain accounted for 89% of the total amount of non-spore-forming bacteria and was an absolute predominant. Although it was recently believed that this bacterium was mainly involved in denitrifying processes in the soil, a several studies indicated that its strains play a major role in nitrogen fixation (Diallo et al., 2004); (Chan, et al., 1994). We believe that *Pseudomonas stutzeri* was actively involved in nitrogen-fixing processes. This was confirmed by the season when soil samples were collected. Summer is the season with the least ongoing denitrification, so we can have a prominent presence of the bacterium only if it was involved in the nitrogen fixation process.

Conclusions

When applying the WRB (2006, 2007) diagnostic criteria for soil classification, the presence of Lixisols and Acrisols in areas occupied by Zheltozem-podzolic soils and Cinnamon forest soils was established on the territory of Strandzha Mountain.

On the second taxonomy level for Lixisols applied prefix qualifier *haplic* and suffix qualifier – *hypereutric*. For Acrisols applied prefix qualifier *haplic*.

The different tree species and the period of litterfall affect the number of microbocenosis and the distribution of microbial groups in it. Increased soil biogenicity was observed in the beech stand, which had a higher Org. C content and more favourable C/N ratio. In the oriental beech stand, the processes of enhanced transformation of easily degradable SOM predominated, compared to oak stand, where more advanced processes of transformation of soil organic matter were observed.

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