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PETROHAN TRAINING AND EXPERIMENTAL FOREST RANGE CAMBISOLS CLASSIFICATION

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Abstract

To classify Cambisols on a second taxonomy level, the territory of Training and Experimental Forest Range Petrohan was differentiated into 48 relatively homogeneous territorial units based on soil formation factors. The dominant influence of acidic products over the basic ones in soil formation process has been proven. Cause-effect relationships were established between ‘pH_{H2O} – exchangeable Ca’, ‘cation exchange capacity – exchangeable acidity’ and ′pH_{H2O} – exchangeable Ca: exchangeable Mg′. The leaching has been advanced, and in some cases, it covers the entire soil profile depth. The high soil acidity defines the main qualifier as *dystric* for the Cambisols classification on a second taxonomy level.

Key words: acidity, basic cations, Cambisols, forest soil, leaching.

Introduction

The first Bulgarian soil classification in Bulgarian literature is the one of N. Pushkarov in 1931. When creating the Common soil map of Bulgaria at a scale of 1:500,000, in its legend soil differences have been written – steppe, forest and azonal. Substantial changes and additions have been made after the implementation of the Russian-Bulgarian expedition in 1947, when I. P. Gerasimov and I. N. Antipov-Karataev developed a new systematic list of Bulgarian soils. In 1948 ‘Soils in Bulgaria’ monograph was developed as well as a new soil map scheme in scale 1:1,000,000. For first time in the monograph brown forest soils were differentiated on level subtype – typical and leached. In 1956 E. Tanov developed medium-scale map of the soils in Bulgaria on a scale 1:200,000. The same year small-scale soil map at scale 1:1,000,000 was made. On these maps brown forest soils were divided into four subtypes – brown forest soils, dark, light and secondary grassland. Based on new studies in different regions of the country the systematic list of soils has been expanded in the following years. The Instruction on identification and mapping of forest habitats and determining dendrocoenotic composition has been developed in 1976, with professor D. Garelkov as a head. For first time brown forest soils were divided into dark, light and transitional, depending on the depth of the humus accumulation horizon in them. A new classification system in which several changes have been made has been developed in 1983 (Instruction … 1983). Brown forest soils were divided into dark, light and typical, and this division has been used in Forest plans until 2011 when the Instruction has been updated (Raikov et al. 2011).

The Basic Soil Classification (Penkov et al. 1992) is the first to give equivalents of the names of soil units in the national classification (Instruction … 1983) with these in the Legend of soil map of the world (FAO 1988).

The significance for brown forest soils is that they start being referred to as Cambisols in Bulgaria, in accordance to international standard, and are divided into two types – *dystric* and *eutric.* The application of this classification requires analytical determination of the quantities of the basic exchange cations and the exchangeable acidity. Until now, no studies have been carried out on the territory of Training and Experimental Forest Range (TEFR) Petrohan to establish the base saturation of the soils and their classification according to the requirements of the Basic Soil Classification in the country and hence to the World Reference Base for soil classification (WRB 2006, 2015). In practice there is no possibility of correlation between the classification used in Forest plans (FP) and in above mentioned classifications. This is confirmed by Malinova (2016).

The aim of this study is to determine the soil base saturation of Cambisols in representative areas which allows their classification according to the modern requirements of WRB (2006, 2015).

Material and Methods

The subject of this study are Cambisols of TEFR Petrohan territory which occupy 87.9 % of it. The forest range is located between 23°04’ and 23°13’ longitude and 43°14’ latitude. It is in the Western Balkan area, Moesian forest district, Northern Bulgaria subdistrict. The total area is 7290.4 ha. The terrain is typically mountainous, with steep slopes, deeply incised river valleys and steep minor ridges. Regarding the climate conditions, the territory is characterized by specific mountain climate – lower temperatures, significant cloudiness and intensive rainfall, high relative humidity and prolonged snow cover. The forest range altitude is between 350 and 1900 m. The average altitude is 1010.6 m (Dobrichov 2016). The largest part of the wood production area of TEFR Petrohan is in the middle mountain belt of beech and coniferous forests (600–1800 m).

An important component for the soil formation process on the territory of TEFR Petrohan is the grade of slopes. Predominantly steep slopes – 47.2 % and inclined terrains – 27.9 %. This is a precondition for rapid surface water drainage and reduces the possibilities of soil re-humidification and water retention. Very steep terrains are 18.9 %, and sloping terrains and flat ones – 5.7 % and 0.3 % of wood productivity area of TEFR Petrohan. According to the Soil Identification among the soil-forming rocks granitoides predominates (Mihailov and Donev 1971). The main tree specimen is the European beech (*Fagus sylvatica* L.). The percentage of the deciduous species is 89.3 % of the total tree species distribution, and the share of the coniferous species is 10.7 % (Dobrichov 2016).

For the study, the forest range territory is differentiated into relatively homogeneous territorial units which allow the selection of representative subjects according to the soil formation factors. The slope, the altitude, the slope exposition and the soil-forming rocks are adopted as criteria for the forest range territory differentiation. The slope is chosen as a leading factor because of its function to determine the direction, mass and velocity of the surface runoff and in addition to influence the other factors of soil formation (Loze and Matie 1998). The similarity in the soil formation factors regarding to climatic conditions is determined by height forest belts, expositions and the similarity of soil-forming rocks – by origin and composition. The field work has been carried out in representative homogeneous territorial units, in which according to Dobrichov (2016) the soils are Cambisols. The units with the largest area are selected and in them full soil profiles are pledged. Morphological descriptions of soil profiles have been made as required by FAO (2006) and Manual for Sampling and Analysis of Soil Guidelines (Cools and De Vos 2010). The litter is characterized by its structure, thickness of its layers and type. In the mineral part of the soil are found: soil horizons, thickness, transition, colour, moisture, soil texture, structure, and effervesce with 10 % HCl solution.

Soil samples are taken for analysis from the litter by layers and from the soil by genetic horizons. Parameters that allow the definition of qualifiers, for the classification of Cambisols on a second taxonomy level for *dystric* or *eutric* are investigated. The following analysis were performed: pH(H_2O) – ISO 10390; exchangeable cations – ISO 11260 and ISO 14254, determination with AAS in 0.1 mol/L solution of $BaCl_2$; exchangeable acidity – ISO 11260 and ISO 14254 (extracted with 0.1 mol/L $BaCl_2$ solution until equilibrated desorption and titration with 0.05 mol/L NaOH); Cation exchange capacity – defined as a sum of basic cations and exchangeable acidity; base saturation.

Results and Discussion

The territory of TEFR Petrohan is divided into 48 relatively homogeneous units with respect to the soil formation factors (Table 1).

Table 1. Signatura, characteristic and area of the territorial units.

No	Slope	Altitude, m	Slope exposition	Soil-forming rocks	Area, ha
1	flat and slanting	0–600	south, south-east, south-west and west	metamorphic silicate rocks	13
2			north, north-west, north-east and east	sedimentary silicate rocks	6.2
3				metamorphic silicate rocks	65.4
4		650–1450	south, south-east, south-west and west	igneous–acid and medium acid rocks	14.3
5				sedimentary carbonate rocks	1.7
6				metamorphic silicate rocks	4.3
7			north, north-west, north-east and east	igneous–acid and medium acid rocks	52.9
8				metamorphic silicate rocks	48.8

No	Slope	Altitude, m	Slope exposition	Soil-forming rocks	Area, ha
9		above 1500	south, south-east, south-west and west	igneous–acid and medium acid rocks	7.3
10				sedimentary silicate rocks	110.8
11				sedimentary carbonate rocks	58.3
46			north, north-west, north-east and east	igneous–acid and medium acid rocks	6.8
12	inclined	0–600	south, south-east, south-west and west	igneous–acid and medium acid rocks	6.3
13				metamorphic silicate rocks	43
14			north, north-west, north-east and east	igneous–acid and medium acid rocks	13.4
15				sedimentary silicate rocks	155.5
16				metamorphic silicate rocks	88
17		650–1450	south, south-east, south-west and west	igneous–acid and medium acid rocks	18.7
18				sedimentary carbonate rocks	13.8
19				metamorphic silicate rocks	21.6
20			north, north-west, north-east and east	igneous–acid and medium acid rocks	75.4
21				metamorphic silicate rocks	57.5
22		above 1500	south, south-east, south-west and west	igneous–acid and medium acid rocks	28.5
23				igneous basic rocks	0.9
24				sedimentary silicate rocks	22.9
25				sedimentary carbonate rocks	37.3
26			north, north-west, north-east and east	igneous–acid and medium acid rocks	18.2
27				sedimentary silicate rocks	0.1
28				sedimentary carbonate rocks	0.4

No	Slope	Altitude, m	Slope exposition	Soil-forming rocks	Area, ha
29	steep and very steep	0–600	south, south-east, south-west and west	igneous–acid and medium acid rocks	4.1
30				sedimentary silicate rocks	29.8
31				metamorphic silicate rocks	146.2
32			north, north-west, north-east and east	igneous–acid and medium acid rocks	116
33				sedimentary silicate rocks	137.8
34				metamorphic silicate rocks	386.2
35		650–1450	south, south-east, south-west and west	igneous–acid and medium acid rocks	937.4
36				sedimentary carbonate rocks	49
37				metamorphic silicate rocks	387.3
38			north, north-west, north-east and east	igneous–acid and medium acid rocks	1865.3
48				sedimentary silicate rocks	27.3
39				metamorphic silicate rocks	1163.2
40		above 1500	south, south-east, south-west and west	igneous–acid and medium acid rocks	346.8
41				sedimentary carbonate rocks	34.5
47				metamorphic silicate rocks	24
42			north, north-west, north-east and east	igneous–acid and medium acid rocks	384.6
43				sedimentary silicate rocks	0.8
44				sedimentary carbonate rocks	26.6
45				metamorphic silicate rocks	35.4

Fourteen soil profiles are investigated, placed in nine of the largest areas. The selected territory units are 4383.3 ha and they comprise 61.8 % of forest range wood production area. The main soil-forming rock in the soil profiles is granite, but there is also sandstone. In the soil profiles all genetic horizons are developed (*A, Bw, C*). The litter depth varies between 1 and 5 cm. It is separated into two organic layers – *L* (fresh organic material) and *FH* (fragmented and partially decomposed organic matter). The forest litter is determined as *moder* type. The depth of the soil profiles (*A*+*Bw* horizons) varies between 20 cm and 109 cm. Depending on the degree of erosion *A* horizon depth varies between 8 cm and 41 cm. *Bw* horizon is between 20 cm and 97 cm+, which meets the requirements for cambic diagnostic horizon.

The pH (H_2O) in *A* horizon of the investigated soil profiles is between 5.5 and 4.1. Most of the soils are assessed as very acidic (profiles 1, 2, 9, 10, 11, 18, 21, 22, 23, 24, 25 and 30). In profile 3 the soil is highly acidic and in profile 28 is medium acidic. The highly soil acidity is result of the complex influence of acidic soil-forming rocks and mountainous climate of the northern slope of the Balkan. According to Nustorova (1988) the composition of soil microflora in this region produces roughly humus compounds with acidic reaction. Producing mainly acidic products of decomposition of organic matter is prerequisite for high leaching of basic elements and soil acidification. According to Ganev (1990) within the soils with pH lower than 4.8 acidification has advanced to the extent that in the soil present free fulvic acids and this explains the lower values of pH. As you can see from the results in Table 2 pH of the litter layers varies between 5.7 and 4.6, average with one pH unit higher than *A* horizon. The analysis shows that the influence of pH of litter layers is lower compared to the acidic products in the mineral part of the soil. Within the soil depth of the profiles pH usually increases and this is related to the increasing influence of soil-forming rocks, which are one of the main sources of basic cations for the soils. This regularity is observed not only on carbonate and basic rocks (Koinov et al. 1998, Teoharov et al. 2009), but also in soils formed on acidic silicate rocks. Malinova (2014) for example has concluded a statistically significant difference in the values of pH in soil profiles with low and medium acidic reaction on the soil surface horizon of *dystric* Cambisols from the forest ecosystems large-scale monitoring network in the country. In the soil depth of the investigated soils is established an increase of pH values in profiles 1, 10, 18, 21, 22, 23, 24 and 25 in *B* horizon and for profile 21 this is observed in *C* horizon. In the other profiles (2, 3, 9, 11, 28 and 30), the profile distribution of pH does not differ in values. The high acidity covers the entire depth of the soil profiles. Similar results are established in Cambisols by Malinova (1996, 2015), Petrova (2018) and others. Contribution to the high acidity of the soils also have acidic atmospheric deposition, which according to Ignatova (2012) in separate years exceed critical loads. The balance between acidic and basic products of soil formation is in favour of acidic ones. Litter cation exchange capacity (CEC) is high and is due to cations with basic functions (Table 2).

The litter is saturated with bases and this is confirmed by other authors in other parts of the Balkan Mountains (Malinova 2016). It depends on a number of factors such as the characteristics of soil-forming rocks, applied forestry practices for example – the raking of litter (Hütll and Schaaf 1993, Robert et al. 2012) and others. Important for this process is the influence of acidic soil-forming rocks (Blaser et al. 2008, Ferreira et al. 2016). It is considered that beech forests have specific impact on soil. According to Völker (1992) and Wittig (1986) the soil acidification at the base of the beech tree trunk is due to the large amount of stem flow. The effect leads to a decrease in saturation with soil bases close to the stems.

The exchangeable Ca predominates

Table 2. Soil pH, exchangeable cations, exchangeable acidity, sum of basic exchangeable cations, cation exchange capacity and base saturation.

Profile No	Horizon	Soil depth, cm	pH(H_2O)	Exch. Ca	Exch. Mg	Exch. K	Exch. Na	Exchangeable acidity	Exch. Mn	Exch. Fe	Sum of basic exchangeable cations	Cation exchange capacity CEC	Base saturation, %
				cmol(+)·kg^{-1}									
1	*LF*	5–0	5.1	28.17	6.50	1.71	0.02	1.21	1.67	0.01	36.40	38	97
	A	0–41	4.5	0.28	0.11	0.05	0.03	0.90	0.02	0.01	0.48	1.38	35
	Bw	41–61	5.1	0.63	0.08	0.02	0.04	1.20	0.01	0.01	0.77	1.97	39
	BwC	61–↓	5.1	0.89	0.10	0.02	0.06	0.95	0.03	0.01	1.07	2.01	53
2	*LF*	1–0	5.4	42.51	4.36	1.07	0.01	1.11	1.15	0.00	47.95	49	98
	A	0–15	4.5	0.36	0.08	0.05	0.01	3.42	0.08	0.01	0.50	3.92	13
	Bw	15–42	4.5	0.09	0.02	0.02	0.02	3.45	0.05	0.01	0.15	3.61	4
	C	42–62–↓	4.5	0.12	0.03	0.03	0.02	3.63	0.07	0.01	0.20	3.83	5
3	*LF*	1–0	5.7	34.88	5.51	1.19	0.03	0.81	0.87	0.02	41.61	42	98
	A	0–36	4.8	1.26	0.23	0.14	0.01	3.13	0.06	0.01	1.65	4.77	35
	Bw	36–58	4.8	0.31	0.05	0.03	0.02	2.91	0.04	0.02	0.42	3.33	13
	C	58–78–↓	4.8	0.46	0.09	0.04	0.03	2.50	0.02	0.02	0.63	3.13	20
9	*LF*	5–0	5.2	33.12	3.09	0.87	0.01	1.01	1.48	0.01	37.09	38	97
	A	0–10	4.6	0.49	0.10	0.10	0.01	4.66	0.03	0.03	0.70	5.36	13
	Bw	10–70	4.7	0.09	0.03	0.02	0.02	1.92	0.02	0.01	0.16	2.08	8
	C	70–↓	5.1	0.07	0.02	0.03	0.03	1.31	0.01	0.02	0.15	1.46	10
10	*LF*	5–0	5.3	36.85	3.13	1.09	0.03	1.21	2.80	0.02	41.10	42	97
	A	0–17	4.3	1.10	0.12	0.10	0.02	5.68	0.16	0.02	1.35	7.02	19
	Bw	17–97	4.8	0.85	0.17	0.05	0.02	2.52	0.06	0.01	1.10	3.62	30
	C	97–↓	5.1	4.32	1.03	0.10	0.06	1.50	0.02	0.00	5.52	7.02	79
11	*LF*	5–0	5.5	38.04	4.92	1.45	0.02	1.11	1.23	0.02	44.43	46	98
	A	0–14	4.7	0.59	0.09	0.08	0.01	3.37	0.11	0.01	0.77	4.13	19
	Bw	14–56	4.7	0.33	0.05	0.05	0.02	2.78	0.09	0.01	0.46	3.24	14
	C	56–↓	5.0	1.81	0.29	0.05	0.03	1.88	0.03	0.02	2.18	4.06	54

Profile No	Horizon	Soil depth, cm	$pH(H_2O)$	Exch. Ca	Exch. Mg	Exch. K	Exch. Na	Exchangeable acidity	Exch. Mn	Exch. Fe	Sum of basic exchangeable cations	Cation exchange capacity CEC	Base saturation, %
				cmol(+)·kg^{-1}									
18	*L*	4–0	5.3	36.22	3.78	1.22	0.03	0.81	1.41	0.02	41.25	42	98
	FH	1–0	5.2	49.01	3.04	0.63	0.03	1.32	1.12	0.01	52.71	54	98
	A	0–10	4.4	1.42	0.30	0.17	0.03	8.90	0.14	0.04	1.92	10.82	18
	Bw	10–62	4.8	0.76	0.09	0.05	0.04	5.22	0.02	0.01	0.94	6.16	15
21	*L*	4–0	5.4	37.98	4.06	1.24	0.04	1.08	1.55	0.03	43.33	44	98
	FH	1–0	4.4	32.30	2.05	0.51	0.02	2.20	1.44	0.02	34.88	37	94
	A	0–17	4.2	1.51	0.28	0.15	0.03	11.14	0.13	0.07	1.97	13.11	15
	Bw	17–90	4.7	0.58	0.07	0.04	0.03	4.38	0.03	0.01	0.73	5.11	14
	BwC	90–↓	5.2	0.32	0.02	0.02	0.02	1.13	0.01	0.01	0.38	1.52	25
22	*L*	4–0	5.4	42.50	5.43	1.85	0.04	1.08	1.25	0.01	49.82	51	98
	FH	1–0	4.5	33.68	2.39	0.77	0.04	2.11	1.41	0.03	36.88	39	95
	A	0–12	4.3	1.86	0.31	0.22	0.03	9.51	0.11	0.05	2.43	11.93	20
	Bw1	12–84	4.9	0.59	0.04	0.02	0.02	2.66	0.01	0.01	0.67	3.33	20
	Bw2	84–109–↓	5.2	0.29	0.02	0.02	0.02	0.94	0.00	0.01	0.35	1.29	27
23	*L*	4–0	5.3	34.67	3.86	1.45	0.01	1.00	1.72	0.02	39.99	41	98
	FH	1–0	4.6	33.25	2.04	0.56	0.04	1.77	2.27	0.03	35.89	38	95
	A	0–13	4.1	1.31	0.24	0.23	0.02	10.52	0.18	0.03	1.80	12.32	15
	Bw	13–47	4.9	0.55	0.04	0.02	0.02	2.85	0.02	0.01	0.64	3.49	18
24	*LF*	2–0	5.1	33.09	3.62	1.20	0.03	0.92	1.22	0.02	37.94	39	98
	A	0–12	4.5	1.40	0.24	0.20	0.03	7.81	0.08	0.04	1.87	9.68	19
	Bw	12–75	4.8	0.50	0.04	0.03	0.03	4.55	0.02	0.01	0.60	5.15	12

Pro-file No	Hori-zon	Soil depth, cm	$pH(H_2O)$	Exch. Ca	Exch. Mg	Exch. K	Exch. Na	Exchange-able acidity	Exch. Mn	Exch. Fe	Sum of basic ex-changeable cations	Cation ex-change capacity CEC	Base satura-tion, %
				$cmol(+)\cdot kg^{-1}$									
25	*L*	4–0	5.3	37.86	4.29	1.49	0.05	0.92	1.83	0.02	43.69	45	98
	FH	1–0	4.6	35.33	2.67	0.90	0.05	1.68	2.17	0.03	38.96	41	96
	A	0–8	4.1	1.62	0.35	0.21	0.03	10.76	0.13	0.09	2.22	12.98	17
	Bw1	8–20	4.6	0.53	0.12	0.07	0.02	5.97	0.04	0.01	0.74	6.72	11
	Bw2	20–58	4.9	0.41	0.04	0.03	0.03	3.34	0.02	0.01	0.51	3.86	13
	BwC	58–105–↓	5.4	0.15	0.01	0.01	0.02	0.93	0.01	0.00	0.20	1.12	17
28	*A*	0–8	5.5	9.06	0.65	0.13	0.04	0.82	0.06	0.01	9.88	10.70	92
	Bw	8–20	5.8	6.36	0.58	0.04	0.03	0.71	0.02	0.01	7.01	7.72	91
	BwC	20–58	6.0	7.51	0.93	0.07	0.05	0.41	0.01	0.01	8.56	8.97	95
30	*LF*	1–0	4.9	28.93	2.79	0.89	0.03	1.43	1.20	0.03	32.64	34	96
	A	0–10	4.4	3.07	0.49	0.35	0.02	7.02	0.17	0.07	3.94	10.96	36
	Bw	10–63	4.7	0.14	0.06	0.04	0.03	4.76	0.04	0.01	0.27	5.03	5
	C	63–93–↓	4.7	0.11	0.04	0.03	0.02	3.26	0.01	0.01	0.19	3.45	6

and varies in layer *LF* between 28.17 $cmol(+)\cdot kg^{-1}$ and 42.51 $cmol(+)\cdot kg^{-1}$ and in FH from 32.30 $cmol(+)\cdot kg^{-1}$ to 49.01 $cmol(+)\cdot kg^{-1}$. Litter base saturation is between 95 – 98 %. This high litter base saturation in beech stands of western Balkan Mountains area is confirmed by other authors. According to Malinova (2014) the difference between the content of exchangeable Ca in the litter and in the topsoil is 14 times in favour of the litter. The difference between the content of the total calcium in litter and in the topsoil is 18 times. This is due to the high acidity of the soil, which favours the presence of increased amounts of easily uptake of calcium for the plants and through the litterfall is back into the litter. It should be noted that litter basic richness is not inherent of the soil surface horizon. Soil leaching occurs and impoverishment of calcium and other mobile elements in acid soils.

Results show that conversion of heterogeneous organic material in the litter into homogeneous humic substances in the soil is connected to significant loss of basic cations. This is proven by the values of CEC in the surface soil horizon. In it CEC highly varies between 1.38 $cmol(+)\cdot kg^{-1}$ and 13.11 $cmol(+)\cdot kg^{-1}$, and decreaces compared to its quantities in the litter – between 3 and 13 times over. According to Vanmechelen

(1997) CEC scale value in majority of the obtained values is classified as high – profiles 18, 21, 22, 23, 25, 28 and 30, medium – in profiles 9, 10 and 24 and low – in profiles 2, 3 and 11. Only in profile 1 the value is very low. The variation of the results for CEC in *A* horizon is mainly due to changes of the quantities of exchangeable Ca and exchangeable acidity, which are connected and with changes of active soil acidity.

Cause-effect relationship 'increasing acidity – decreasing values of the exchangeable Ca' is illustrated in Figure 1. It is proven with moderately high value of correlation coefficient (*r*=0.69). Along with the decrease of exchangeable Ca, the soil exchangeable acidity increases, and this affects the magnitude of CEC. CEC increases due to increasing of soil exchangeable acidity (*r*=0.80) (Fig. 2).

In the soil profiles depth, the values of CEC decrease, except in profile 1, which is highly leached and has lower values of exchangeable Ca (Table 1). It should be noted that although very high soil acidity the leaching is on a stage where the exchangeable cations are ordered by quantity in their usual order exchangeable Ca > exchangeable Mg > exchangeable K > exchangeable Na. The ratio between exchangeable Ca: exchangeable Mg in *A* horizon is decreased to a maximum of 3 (profile 1) with pH 4.5 and is highest – 14 (in profile 28) with pH 5.5. These changes are due to a reduction in the quantities of exchangeable Ca in the process of soil acidification. The correlation between 'pH–exchangeable Ca: exchangeable Mg' is proven by the correlation coefficient *r*=0.66. Thirteen of the fourteen investigated soil profiles correspond to the definition for qualifier *dystric*. The base saturation in *A* horizon of these profiles varies between 13 % and 36 %, in *Bw* horizon is between 4 % and 39 %. The value of 4 % base

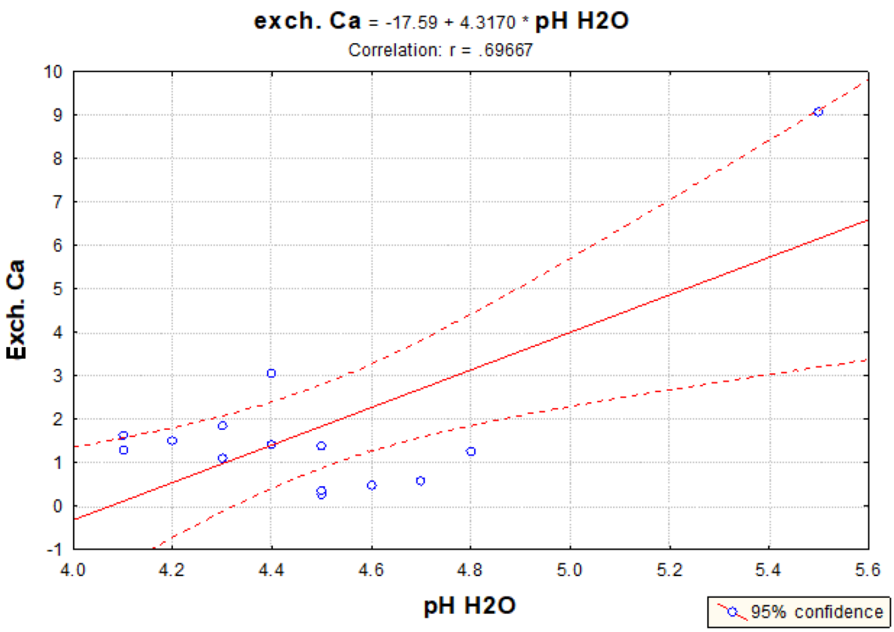

Fig. 1. Relationship between soil active acidity and exchangeable Ca.

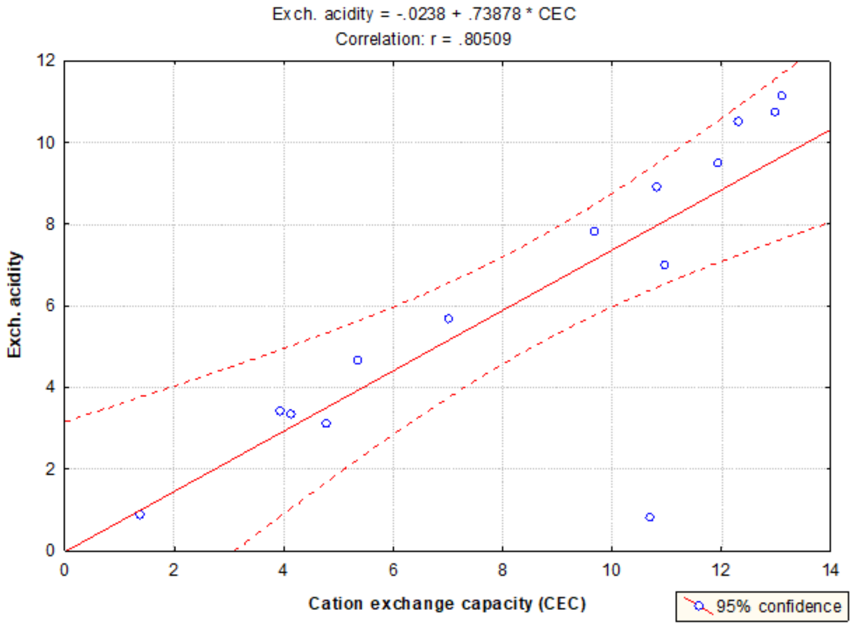

Fig. 2. Relationship between magnitude of Cation exchange capacity (CEC) and soil exchangeable acidity.

saturation is very low, but it remains above the critical 3 % below which damage to the roots of beech seedlings was observed (Richter et al. 2007, Richter et al. 2011).

In one of the soil profiles – 28 the soil is with high base saturation – 91–92 % within the surface horizon and in cambic horizon.

The cation exchange properties of Cambisols in the representative samples show that on a second taxonomy level they classify as *dystric.* In only one soil profile the qualifier is *eutric.*

Conclusions

The soil formation process in the investigated Cambisols of TEFR Petrohan is aimed at the dominant influence of acidic products obtained of the decomposition of organic matter over basic ones – associated with soil weathering processes in soil-forming rocks. The leaching is increased, and in some cases, it covers the whole soil profile depth. The high soil acidity defines as a main qualifier *dystric* for the Cambisols classification on a second taxonomy level.

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