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SOIL TEXTURE OF CALCARIC AND NON-CALCARIC RENDZINA SOILS IN SERBIA

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The present investigation of textures of rendzina soils in Serbia is part of a more comprehensive research into effects of decarbonation and different land uses on physical and chemical characteristics of that widespread soil type in Serbia. Geological parent material was found to have a predominant influence on the texture of rendzina soils. Rendzinas on sandy marl were found to be heavily skeletoidal and skeletoidal sandy loams or skeletoidal clay loams in A horizon and skeletal sandy loams or heavily skeletoid sandy-clay loams in AC horizon. Rendzinas on calcareous gravel are skeletoidal clay loams in A horizon, skeletoidal sandy loams in AC horizon and heavily skeletal sandy loams in C horizon. Rendzinas on unindurated limestone are slightly skeletoidal loams or skeletoidal clay loams. The rendzinas on marl and marly or unindurated limestone are mostly slightly to heavily skeletoidal light clays.

Differences in texture between calcaric and non-calcaric soils (the latter containing less skeletal material, i.e. stone and especially

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gravel, and more clay) were not found statistically significant. Skeletal quality increases with solum depth in non-calcaric rendzinas, and the fine earth fraction has a heavier texture, in contrast to calcaric rendzinas, where the situation is highly heterogenous.

Rendzinas under forests were found to be significantly more skeletal than those under grassland and arable land. Little difference in texture was observed in rendzinas under grassland and arable land.

Key words: soil texture, calcaric rendzina, non-calcaric rendzina, land use

INTRODUCTION

Since late 19th century, the term "rendzina soil" has been used in reference to soils of the A-C horizons on calcareous and calcareous-silicate parent materials. Some authors have classified all soils on calcareous and calcareous-silicate parent materials as rendzina, while others have narrowed the term to refer only to the A-C horizon soils on weathering calcareous and calcareous-silicate parent materials. In our latested domestic classification (ŠKORIĆ *et al*., 1985), rendzina is described as a soil type belonging to the order of automorphic soils and class of humus-accumulating soils with an Amo-AmoC-C profile, which developed on loose parent material containing over 20% calcareous material. According to an U.S. definition (SSSA, 1971), rendzina is a great soil group of the intrazonal order and calcimorphic suborder consisting of soils with brown or black friable surface horizons underlain by light gray to pale yellow calcareous material developed from soft, highly calcareous parent material under grass vegetation or mixed grasses and forest in humid and semiarid climates. The latest Russian classification (ŠIŠOV *et al*., 2000) places rendzina into a class of post-lithogenic soils and order of organic matter-accumulating soils with a fulvate-humate type of humus. According to the World Reference Base (WRB) of soil resources, rendzinas are classified into the leptosol group, i.e. leptosols developed on highly calcareous material, a 10-25 cm mollic horizon lying immediately upon parent material that contains 40% or more carbonate (FAO, 2001).

No recorded data on distribution of rendzina soils in Serbia are currently available, except for an area of some 15,000 ha in Vojvodina, or more precisely the region of Srem (MILJKOVIĆ, 1972), and around 31,000 ha in Montenegro (FUŠTIĆ, 2000). Based on years of soil research in the field, Prof Dr M. Živković has estimated that rendzina soils are to be found on an area of at least 100,000 ha in Serbia. That rendzinas are widespread in Europe is evident from the fact that it was included in the first generation of EUROSOL as one of the five most widespread soils in the territory of the European Union (PLAZA *et al*., 2005; SENESI *et al*., 2003).

Even though rendzina is such a widespread soil type, its research in this country has so far been mostly sporadic and conducted either for purposes of soil mapping in some parts of Serbia (ANTONOVIĆ *et al*., 1974; MILJKOVIĆ, 1972; SPASOJEVIĆ *et al*., 1975) or for preparation of soil for agricultural production

(ŽIVKOVIĆ *et al*., 1981). Our research into rendzina texture in Serbia, presented in this work, is part of a more comprehensive investigation aiming to determine the effect of decarbonation and different forms of land use on phyisical and chemical properties of that very widespread soil type in Serbia. The sites investigated in this study included the hillsides of Mt. Fruška gora in Vojvodina; Topola and Aranđelovac environs in central Serbia; Jablanica basin and areas around Lajkovac and Valjevo in western Serbia; Sjenica-Peštar plateau in south-western Serbia; Negotin environ in eastern Serbia; and the Niš-Pirot stretch in south-western Serbia.

MATERIALS AND METHODS

At each site under investigation, we sampled both the carcaric and non-calcaric rendzina variants from each of the three defined land uses if all of them were available. Calcaric rendzinas predominated at all sites, so that more profiles of that sub-type were processed than of the non-calcaric sub-type. Thirty soil profiles where included in the field investigation, i.e. 24 profiles of calcaric (9 forest, 9 grassland and 6 arable land) and 6 profiles of non-calcaric (3 forest, 2 grassland and 1 arable land) rendzina soils. A total of 51 soil samples where collected and analyzed from A and AC horizons (where those were found).

Laboratory examination of soil texture was done by pipetting and soil preparation with Na-pyrophosphate (JDPZ, 1997).

Statistical data processing was done using the StatSoft Statistka 5.0 software. T-test was employed to compare soil textures between calcaric and non-calcaric rendzina soils, as well as the variants based on land use type. Significance of the differences found was determined at 95% confidence.

RESULTS AND DISCUSSION

Rendzina is a soil type found in A-C horizons bound to unindurated calcareous parent material, which is why it can be found at very different altitudes in nearly all parts of Serbia. The rendzina soils investigated in this study (Table 1) were found at altitudes starting from 150 m near Lajkovac to 1200 m at the Sjenica-Pešter plateau. Most sites, i.e. those in Vojvodina, eastern Serbia, Šumadija region and Pirot and Bela Palanka environs in south-eastern Serbia, are located at up to 400 m al . Altitudes exceeding 400 m were found in western Serbia, i.e. the Valjevo environ, while sites in the area of Niš in south-eastern Serbia were found at over 700 m al.

Being developed mostly on unindurated and loose calcareous parent material, Serbian rendzinas are mostly found in smoother forms of relief ranging from slightly undulating to hilly. Such round-shaped reliefs, developed on loose and unindurated calcareous sediments, stand either independently or lean against hard limestone and dolomite mountain massifs, such as the sites in western Serbia and Niš area.

Table 1. – Details on research sites

Site	Pro file	Relief description	Parent material	Sub type	Land use
Negotin Kosa	1	hillside top, terrace, 199 m al.	unindurated limestone	c*	f*
	2	hillside top, terrace, 199 m al.	unindurated limestone	c	f
	3	hillside top, terrace, 199 m al.	unindurated, sandy limestone	c	g**
	4	hillside top, terrace, 199 m al.	loesslike loam with underlying limestone	c	g
	5	hillside top, terrace, 199 m al.	unindurated limestone	c	g
	6	hillside top, terrace, 199 m al.	unindurated limestone	c	g
	7	terrace, slight westward incline, 199 m al.	unindurated limestone	nc**	f
	8	very slight incline, 199 m al.	unindurated limestone	nc	g (f)
Negotin, Vančina česma	9	slight eastward incline, 250 m al.	weathering unindurated limestone	c	a***
	10	slight eastward incline, 250 m al.	loesslike marly sediment with underlying limestone	nc	a
Sjenica, Brnjica	11	40° westward incline, 1210 m al.	marly limestone	c	g
Vojvodina, Stari Slankamen	12	summit, flat, 190 m al.	sandy marl	c	g
	13	60° eastward slope, 187 m al.	sandy marl	c	g
Lajkovac, Slovac	14	summit, flat, 172 m al.	marl	c	a
	15	60° south-eastward slope, 151 m al	marl	c	f
Valjevo, Jovanja	16	55° northward slope, 443 m al.	unindurated limestone	c	f
Valjevo, Rovni	17	summit, slightly sloping northwards, 560 m al.	unindurated limestone	nc	g
Topola, Oplenac	18	summit, slightly sloping southwards, 261 m al.	unindurated limestone	c	f
Topola, Mitrovčić	19	20° sloping westwards, 240 m al.	unindurated limestone	c	a
Topola-Aranđelovac, Banja	20	60° slop.south-westwards, 290 m al	unindurated limestone	nc	f
	21	slope slightly inclined south-westward, 280 m al.	unindurated limestone	nc	g
Bela Palanka, Čiftik	22	middle of slope at 45°, inclined eastwards, 438 m al.	non-calcaric limestone	c	f
Pirot	23	60° slop. north-eastwards, 375 m a.	sandy marl	c	f
	24	30° slop. north-eastwards, 370 m al	sandy marl	c	a
Pirot, Provalija	26	very slight north-westward slope, 448 m al.	calcareous gravel	nc	f
Pirot, Prebijen Del	27	foot of hill, slight southward slope, 337 m al.	unindurated limestone	c	a
	28	45° inclined southwards, south-westwards, 335 m al.	marly limestone	c	g
Pirot, Staničenje	29	80° south/south-westwards slope, 370 m al.	calcareous marl	c	f
Niš, Ostrovica	30	40° westwards slope, 720 m al.	unindurated limestone	c	f
	31	30° westwards slope, 715 m al.	unindurated limestone	c	a

*c-calcaric, **nc-non-calcaric; *f-forest, **g-grassland, ***a-arable land

The south-eastern peripheral slopes of Mt. Fruška gora drop precipitously down to the Danube River. The terrain around Negotin is undulating and slightly hilly. Hilly terrain is also to be found on the sites in Šumadija and south-eastern Serbia. A more hilly relief is found in the area of Lajkovac and Valjevo, where precipitous slopes are undergoing erosion. Flattened areas at hill tops serve as arable land, while steep slopes are covered in forest vegetation. In south-western Serbia, i.e. on the Sjenica-Peštar plateau, areas of rendzina soil show as small but distinct hilly reliefs, very much like islands in an otherwise undulating area, and they are all covered in grass vegetation.

Under a classification proposed by ŠKORIĆ *et al.* (1985), most of the profiles investigated were found to belong to rendzina soils on unindurated or marly limestone, calcaric, (profiles 1, 2, 3, 4, 5, 6, 9, 11, 18, 19, 22, 27, 28, 30 and 31) predominantly with Amo-C or Ap-C profile structure, and less often with Amo-AC-C structure. Following are the rendzinas on unindurated or marly limestone, non-calcaric (profiles 7, 8, 10, 16, 17, 20 and 21) with the same profile structure as the calcaric type. The same number of profiles belong to rendzinas on marl, calcaric (profiles 12, 13, 14, 15, 23, 24 and 29) with predominantly Amo-AC-C profile structure. One profile alone (26) was found to be a rendzina on calcareous gravel, non-calcaric and with Amo-AC-C profile structure.

The results of particle size analysis indicate significant differences in the specific particle contents in the rendzina profiles examined (Table 2). Major variation was found in the content of both fractions of coarse fragments: 0.11-54.09% stone (11.89% on the average, SD=12.27) and 0.47-35.10% gravel (7.30% on the average, SD=8.14).

Considerable variation was also found regarding fine earth texture. Total sand content varied 20.40-70.20% (average 44.66%, SD=11.13) with fine sand predominating with 17.84-58.22% (average 33.36%, SD=8.45), compared to coarse sand with 1.80-34.25 (average 11.10%, SD=7.92). The narrowest interval was found in the silt fraction, 15.48-42.56 (average 24.48%, SD=6.42). Clay content varied from a mere 8.04 to 44.76% (average 30.10%, SD=9.02).

Rendzina is a soil type developed on many very different calcareous parent materials and such diversity of geological parent material was found to be closely related to soil texture of the rendzinas investigated. The lightest texture was found in rendzinas from the south-eastern peripheral slopes of Mt. Fruška gora (Stari Slankamen) developed on sandy marl, which fall into the texture class of heavily skeletoidal sandy loams (profiles 12 and 13). Heavily skeletoidal (A horizon) and skeletal (AC horizon) sandy loams were also found in forest rendzinas of the Pirot environ (profile 23), again developed on sandy marl, while the arable land rendzina of the same site (profile 24) is a skeletoidal clay loam in A horizon and heavily skeletoidal sandy-clay loam in AC horizon. Skeletoidal clay loam is the texture class of a shallow A horizon of forest rendzina at Provalija (profile 26), Pirot, developed on calcareous gravel, while the transitional AC horizon is a skeletoidal sandy loam, and C horizon a heavily skeletal sandy loam.

Table 2. - Texture of rendzina soil type

Profile	Depth	Horizon	Coarse fragments (%)			Fine earth (%)					
			total	stone	gravel	sand total	sand coarse	sand fine	physical clay	silt	colloidal clay
	cm		>2 mm	>20 mm	20-2 mm	2-0.02 mm	2-0.2 mm	0.2-0.02 mm	<0.02 mm	0.02-0.002 mm	<0.002 mm
1	0-10	Amo	4.40	1.11	3.29	44.52	9.98	24.56	55.48	22.00	33.48
	10-25	Amo	21.54	17.55	3.99	39.88	6.25	33.63	60.12	23.32	36.80
2	0-10	Amo	7.85	4.13	3.72	42.84	6.23	36.61	57.16	25.16	32.00
	10-20	Amo	2.96	1.68	1.28	41.96	6.30	35.66	58.04	21.08	36.96
3	0-15	Amo	21.30	11.19	10.11	40.40	9.14	31.26	59.60	23.12	36.48
	15-30	Amo	26.11	15.08	11.03	39.84	8.83	31.01	60.16	25.44	34.72
4	0-15	Amo	6.49	3.42	3.07	40.96	6.92	34.04	59.04	19.12	39.92
	15-30	Amo	5.09	2.52	2.57	44.68	7.37	37.31	55.32	16.92	38.40
5	0-15	Amo	5.65	2.08	3.57	44.12	7.41	36.71	55.88	20.36	35.52
6	0-15	Amo	5.66	3.53	2.13	43.36	4.13	39.23	56.64	22.32	34.32
	15-30	Amo	4.07	1.60	2.47	40.96	3.32	37.64	59.04	22.36	36.68
7	0-20	Amo	1.38	0.78	0.60	54.24	11.40	42.84	45.76	16.80	28.96
	20-45	Amo	0.68	0.19	0.49	53.68	8.81	44.87	46.32	15.56	30.76
8	0-15	Amo	3.49	0.57	2.92	48.72	6.71	42.01	51.28	20.24	31.04
	15-30	Amo	2.16	0.71	1.45	41.64	6.95	34.69	58.36	19.88	38.48
9	0-10	Ap	4.34	1.81	2.53	47.04	11.40	35.64	52.96	19.48	33.48
	10-25	Ap	7.56	3.60	3.96	44.60	7.26	37.34	55.40	21.00	34.40
10	0-20	Ap	0.58	0.11	0.47	54.76	19.21	35.55	45.24	18.64	26.60
	20-40	Ap	1.60	0.12	1.48	51.32	19.19	32.13	48.68	19.84	28.84
	40-50	AC	12.75	1.43	11.32	39.52	7.66	31.86	60.48	20.60	39.88
11	0-15	Amo	11.68	6.98	4.71	33.24	5.31	27.93	66.76	28.68	38.08
12	0-20	Amo	32.87	17.61	15.26	70.20	33.61	36.59	29.80	21.76	8.04
13	0-20	Amo	32.67	24.41	7.26	62.60	20.02	42.58	37.40	27.56	9.84
14	0-20	Ap	28.79	15.59	13.20	47.44	14.73	32.71	52.56	29.56	23.00
	20-40	AC	13.41	8.32	5.09	52.00	17.61	34.39	48.00	26.68	21.32
15	0-20	Amo	37.85	22.34	15.51	33.84	5.57	28.27	66.16	41.08	25.08
	20-40	AC	18.57	8.13	10.44	36.72	7.02	29.70	63.28	41.12	22.16
16	2-20	Amo	7.95	2.17	5.78	48.64	14.59	34.05	51.36	37.84	13.52
17	0-20	Amo	22.04	20.08	1.96	23.00	1.80	21.20	77.00	37.64	39.36
18	0-20	Amo	20.17	18.07	2.10	20.40	2.56	17.84	79.60	34.84	44.76
19	0-17	Ap	19.33	7.56	11.77	32.72	7.88	24.84	67.28	29.52	37.76
20	0-20	Amo	3.20	1.12	2.08	26.92	2.20	24.72	73.08	42.56	30.52
21	0-20	Amo	2.15	0.44	1.71	28.04	3.31	24.73	71.96	38.12	33.84
22	0-20	Amo	43.33	23.19	20.14	39.96	10.21	29.75	60.04	28.56	31.48
	20-40	AC	56.07	26.11	29.96	40.24	14.56	25.68	59.76	29.20	30.56
23	0-15	Amo	37.17	33.46	3.71	68.68	11.68	57.00	31.32	20.01	11.32
	15-30	AC	68.44	33.34	35.10	65.44	7.22	58.22	34.56	21.64	12.92
24	0-20	Ap	18.05	12.10	5.95	53.24	8.51	44.73	46.76	23.36	23.40
	25-40	AC	45.48	12.26	33.22	63.32	9.30	54.02	36.68	19.08	17.60
26	0-12	Amo	21.02	17.54	3.48	55.40	28.79	26.61	44.60	23.12	21.48
	12-23	Amo	29.77	18.53	11.24	56.76	34.25	22.51	43.24	16.64	26.60
	23-40	AC	70.67	54.09	16.58	55.08	33.10	21.98	49.68	15.48	29.44
27	0-20	Ap	18.29	17.12	1.17	37.36	8.80	28.56	62.64	23.12	39.52
	20-40	Amo	8.11	7.12	0.99	37.60	6.70	30.90	62.40	22.60	39.80
28	0-14	Amo	9.92	7.88	2.04	37.60	7.36	30.24	62.40	27.44	34.96
	14-30	AC	20.74	20.05	0.69	41.76	12.04	29.72	58.24	22.12	36.12
29	0-20	Amo	33.02	17.95	15.07	47.08	15.48	31.60	50.92	28.72	22.20
30	0-10	Amo	24.19	15.56	8.63	52.08	18.56	33.52	47.92	24.48	23.44
	10-30	AC	60.29	50.92	9.37	51.72	20.24	31.48	48.28	23.84	24.12
31	0-20	Ap	8.95	6.33	2.62	28.76	4.21	24.55	71.24	29.12	42.12
	20-40	Amo	9.73	6.84	2.89	30.80	4.47	26.33	69.20	26.60	42.60

Loam texture class was found in the slightly skeletoidal forest rendzina of the Valjevo environ developed on unindurated limestone (profile 16), while clay-loam skeletoidal rendzina of arable land was found in the area of Lajkovac (profile 14). All other rendzinas, formed on marl and marly or unindurated limestone are mostly slightly to heavily skeletoidal light clays.

In rendzina soils with solum depth exceeding 20 cm, either with a deep A horizon or a physiologically active profile deepening at the expense of AC horizon, it was possible to observe texture changes down the profile. With soil depth, coarse fragments (stone and gravel in equal measures) increase in 62% of the profiles, and decrease in the remaining 38%. In the fine earth class, the contents of coarse and fine sands increase and decrease in approximately equal number of profiles. Silt content decreases in 57% of the profiles, and increases in the remeaining 43%, while clay fraction increases with solum depth in a prevailing number of profiles (71%).

Research of rendzinas in some parts of Serbia have so far shown their diverse textures. According to SPASOJEVIĆ *et al*. (1975), rendzinas on marly limestone at Mravinci (Jablanica River basin) is calcareous clay in the Amo horizon containing up to 30% coarse fragments, while the transitional AmoC horizon is clay loam with 60% coarse fragments. Rendzina on marly limestone (Sovač) is a stony clay loam in a shallow Amo horizon with 15-20% coarse fragments. Rendzina on marl (Stubo) in a shallow Amo horizon is also a clay loam contaning up to 10% coarse fragments. Rendzina on calcareous sandstone (Poćuta) in a shallow Amo horizon has no coarse fragments and its texture is clay loam. According to ŽIVKOVIĆ *et al*. (1981), rendzinas in the Negotin environ are medium or heavy loams and light clays. Calcaric rendzinas are characterized by small depth and considerable content of coarse fragments; they are slightly and medium skeletoidal in the upper layer of the humus horizon, and coarse fragments increase content considerably with depth. According to findings reported by ANTONOVIĆ *et al*. (1974), a typical rendzina on marl in the Timok River basin is always a clay. In shallow profiles, physical weathering is not complete and there is consequently a considerable proportion of coarse fragments, fine sand and silt in the profiles analysed.

No significant difference in texture was found between the calcaric and non-calcaric rendzinas investigated either regarding the content of coarse fragments (Fig. 1) or fine earths (Fig. 2). On the average, non-calcaric rendzinas contain less coarse fragments (stone and especially gravel) and more clay, but the difference has no statistical significance.

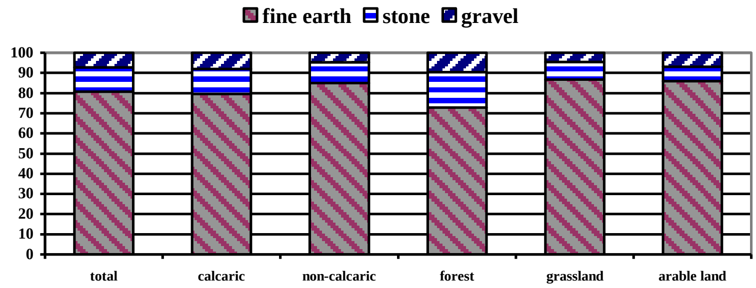

Figure 1. – Distribution of coarse fragments in rendzina soils investigated (mean in %)

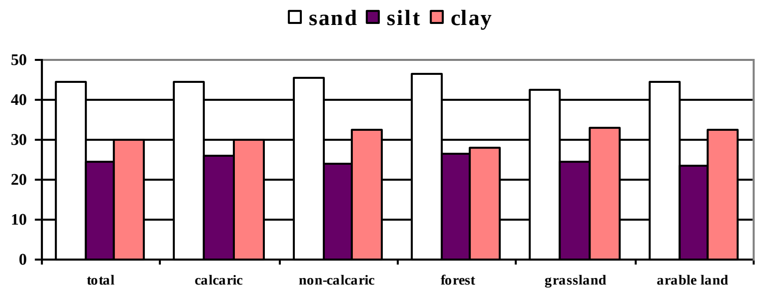

Figure 2. Distribution of fine earth particls in rendzina soils investigated (mean in %)

Difference in soil texture is more evident regarding changes down the profile. The content of coarse fragments increasing with solum depth was found in fewer profiles (56%) of calcaric rendzinas than non-calcaric (80%). A difference was also found in the texture of fine earths. The content of coarse and fine sand in calcaric rendzinas increases with depth in most profiles (62%), while it decreases in as much as 80% of non-calcaric profiles. Silt content increases and decreases with depth in approximately equal number of profiles in calcaric and non-calcaric rendzinas. The difference is most evident in the clay fraction. Its content increases with depth in 62% of the profiles of calcaric rendzinas, while the content of colloidal clay increases with solum depth in all profiles of non-calcaric rendzinas.

To summarize, the A horizons of non-calcaric rendzinas contain the retained coarse fragments, non-calcerous stone and gravel; coarse fragments content increases with depth, especially in the transitional AC horizons, in which coarse fragments containing calcareous material are already present (e.g. profiles 10 and 26). In calcaric rendzinas, as suggested by ANTONOVIĆ *et al*. (1974), physical weathering is not fully completed, and there is consequently no evident regularity in the content of coarse fragments down the solum. On the other hand, texture of fine earth becomes heavier with depth in non-calcaric rendzinas, i.e. the sand fraction decreases and the colloidal clay fraction increases, in contrast to calcaric rendzinas, in which sand and clay contents increase with depth in most profiles.

More difference in rendzina textures were found between the different land use variants. Forest rendzinas contain significantly more total coarse fragments than those covered with grassland (t=3.07506, p=0.00700). No significant difference was found regarding the gravel fraction, but it was found regarding the stone fraction. Forest rendzinas contain a stone fraction that is significantly greater statistically than in arable land rendzinas (t=2.36130, p=0.034491), and even more in grassland (t=3.05210, p=0.008069). Higher content of coarse fragments in forest rendzinas than in the other two variants is caused primarily by differences in terrain characteristics. Forest rendzinas are mostly found on more precipitous slopes with conditions of surface erosion, which carries off fine earth and keeps rock fragments in place in the profile.

Differences were also found regarding fine earth textures. Statistically, forest rendzinas contain significantly more silt than those of arable land (t=2.33050, p=0.036529). However, the content of colloidal clay in forest rendzinas is significantly lower statistically than in rendzinas covered with grassland vegetation (t=2.80160, p=0.012264).

CONCLUSION

Geological parent material under the rendzina soils investigated in this study has a decisive influence on their textures. Renzdinas on sandy marl are heavily skeletoidal and skeletoidal sandy loams or skeletoidal clay loams in A horizon and skeletal sandy loams or heavily skeletoidal sandy-clay laoms in AC horizon. The rendzinas on calcareous gravel are skeletoidal clay loams in A horizon, skeletoidal sandy loams in AC horizons, and heavily skeletal sandy loams in C horizon. Rendzinas on unindurated limestone are slightly skeletoidal loams or skeletoidal clay loams. Rendzinas on marl and marly or unindurated limestone are mostly slightly to heavily skeletoidal light clays.

The difference in textures between the calcaric and non-calcaric rendzinas (the latter containing less coarse fragments, i.e. stones and especially gravel, and more clay) has no statistical significance. In non-calcaric rendzinas, coarse fragments increase with solum depth, and the fine earth fraction has a heavier texture, in contrast to a more heterogenous situation in calcaric rendzinas.

Compared to grassland and arable land rendzinas, forest rendzinas were found to have significantly more coarse fragments and less clay. The former two showed no significant difference regarding texture.

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MEHANIČKI SASTAV KARBONATNIH I IZLUŽENIH RENDZINA U SRBIJI

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I z v o d

Ispitivanja mehaničkog sastava u zemljištu tipa rendzina u Srbiji, prikazana u ovom radu, deo su širih istraživanja čiji je cilj bio utvrđivanje uticaja procesa izluživanja i različitog načina korišćenja zemljišta na fizičke i hemijske osobine tog veoma rasprostranjenog tipa zemljišta u Srbiji. U tom smislu, istraživanjima su obuhvaćeni različiti delovi Srbije: Vojvodina - obronci Fruške gore, Šumadija (Topola-Aranđelovac), zapadna Srbija (sliv reke Jablanice, okolina Lajkovca i Valjeva), jugo-zapadna Srbija (Sjeničko-pešterska visoravan), istočna Srbija (okolina Negotina) i jugoistočna Srbija (Niš-Pirot). Terenskim istraživanjima je bilo obuhvaćeno ukupno trideset reprezentativnih profila, od 24 profila karbonatnih rendzina (9 pod šumom, 9 pod travnjakom i 6 pod njivom) i 6 profila izlužene (3 pod šumom, 2 pod travnjakom i 1 pod njivom). Ukupno 51 uzoraka zemljišta iz A ili AC horizonata (ako je razvijen) je analizirano.

Preovlađujući uticaj na mehanički sastav ispitivanih rendzina ima geološki supstrat na kojem su obrazovane. Rendzine na peskovitim laporcima su jako skeletoidne i skeletoidne peskovite ilovače ili skeletoidne glinaste ilovače u A horizontu i skeletne peskovite ilovače ili jako skeletoidne peskovito-glinaste ilovače u AC horizontu. Rendzine na karbonatnom šljunku su skeletoidne glinaste ilovače u A horizontu, skeletoidne peskovite ilovače u AC horizontu, a C horizont jako skeletna peskovita ilovača. Rendzine na mekanim krečnjacima su slabo skeletoidne ilovače ili skeletoidne glinaste ilovače. Rendzine na laporcima, laporovitim ili mekanim krečnjacima, su uglavnom slabo do jako skeletoidne lake glinuše.

Razlike u mehaničkom sastavu između karbonatnih i izluženih rendzina (izlužene rendzine sadrže manje skeleta: kamena, a naročito šljunka, i više gline) nisu statistički značajne. U izluženim rendzinama sa dubinom soluma povećava se skeletnost zemljišta, a sitne frakcije zemljišta su težeg mehaničkog sastava, za razliku od karbonatnih rendzina gde je stanje veoma heterogeno.

Rendzine pod šumom su značajno skeletnije i manje glinovite u poređenju sa rendzinama pod travnjacima i njivama. Rendzine pod travnjacima i njivama ne razlikuju se značajno po mehaničkom sastavu.

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