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BARTŁOMIEJ GLINA*, PAWEŁ JEZIERSKI, CEZARY KABAŁA

Wrocław University of Environmental and Life Sciences, Institute of Soil Science and Environmental Protection
ul. Grunwaldzka 53, 50-357 Wrocław

Physical and water properties of Albeluvisols in the Silesian Lowland (SW Poland)

Abstract: Soil texture, bulk and specific density, total porosity, and the water capacity at pF 0–2.7 were measured in Albeluvisols with more or less pronounced lithological discontinuity. The soil pits were located in the north-eastern part of the Silesian Lowland, on the glacial plain built of till blanketed with cover materials of various origin, mainly sands. Distinct albeluvic tongues with sandy texture and strong stagnic color mosaic at the contact of eluvial and illuvial horizons were identified in all profiles under study. The lowest bulk density was measured in the plough layers, while the highest in subsoil EBw horizons or glossic E/Bt horizons. Total porosity was the largest in plough layers, rapidly decreased in subsoil E horizons and then back increased with depth. Water capacity (at each measured pF value) was strongly correlated mainly with clay content and rapidly raised in E/Bt horizons. The highest field water capacity was measured in E/B horizons at low albeluvic tonguing intensity, or in deeper parts of Bt horizon at larger intensity of albeluvic tonguing into the illuvial horizon. The easily available water stock in the upper 100 cm-thick column of Albeluvisols with lithological discontinuity depends mainly on the depth of transition of eluvial (coarser) and illuvial (finer-textured) zones, similarly to typical Luvisols with the same type of textural (lithological) variability in the soil profile.

Key words: Albeluvisols, water properties, soil texture, lithological discontinuity

INTRODUCTION

Albeluvisols cover over 3.2 mln km^2 of the Earth surface, mainly in the north-eastern Europe, northern and central Asia, and South America (Bockheim and Gennadiev, 2000). The origin of these soils is mainly related to lessivage process that means a substantial vertical transfer of clay particles from the near-surface to the deeper layers (De Jonge et al., 2004), that differentiates the soil profile into a clay-depleted eluvial horizon and clay-enriched *argic* horizon, where the clay illuviation is identified by the presence of clay skins and coatings visible both in the macroscopic and microscopic scales (Konecka-Betley and Zagórski, 1994). The distinguishing between Albeluvisols and Luvisols based on the occurrence of albeluvic tonguing in the upper part of *argic* horizon (Komisja V Genezy, Klasyfikacji i Kartografii Gleb PTG, 2011; IUSS Working Group WRB, 2007). Tongues formation is related to the periglacial climate and ice wedges (Konecka-Betley and Zagórski, 1994; Szymański et al., 2011; Szymański and Skiba, 2012) or to the ferrolysis process (Van Ranst and De Coninck, 2002). Luvisols and Albeluvisols are developed from a various parent materials, including loess and other silts (Turski and Witkowska-Walczak, 2004; Szymański et al., 2011; Szymański et al., 2012), glacial tills, and glacial sands (Buczko et al., 2002; Jaworska and Dąbkowska-Naskręt, 1999; Komisarek and Szałata, 2008; Sauer et al., 2009).Specific case of Luvisols and Albeluvisols are soils with a lithological discontinuity, where the surface humus and eluvial horizons are developed from the younger "cover materials" (mainly the glacio-fluvial or eolian sands), and the deeper horizons, including illuvial Bt horizon – from the till of the older glaciation. The textural change in these soils is accompanied by the clear differentiation of bulk density and other physical soil properties (Porębska et al., 2010; Zaleski, 2012), which affects the soil water properties (Bogacz et al., 2008). Water retention and amounts of plant-available water are among the most important parameters describing the functional and ecological soil properties (Dexter, 1997). Physical and water properties of the Luvisols, including the water retention, is well recognized and described in the professional literature (Kaczmarek, 2001; Kaczmarek et al., 2006; Kobierski and Dąbkowska-Naskręt, 2002; Marcinek and Komisarek, 2004; Paluszek, 2011; Walczak et al., 2002a). However, much less available (Komisarek and Szałata, 2008) is information about the possible differences in physical and water properties between "typical"

*email: bartlomiej.glina@up.wroc.pl

Luvisols and Albeluvisols, recently introduced to the Polish Soil Classification (Komisja V Genezy, Klasyfikacji i Kartografii Gleb PTG, 2011) at the "type" level.

The aim of work was to determine selected, basic physical and water properties of Albeluvisols developed from sandy and loamy materials with more or less pronounced lithological discontinuity, that are widespread in the north-eastern part of the Silesian Lowland. To the preliminary comparison, two pairs of the most typical Albeluvisols (four profiles) were selected.

MATERIAL AND METHODS

The Oleśnicka Plain, situated in the north-eastern part of Silesian Lowland, is a gently undulated glacial plain, built of the ground moraine tills of Riss Glacial Stage (Odra Glaciation in Polish terminology) blanketed with a thin layer of cover sands of various origin (fluvial, colluvial, eolian, etc.) and age. Therefore, the various types of lithological discontinuity are common within the profiles of prevailing Luvisols and Albeluvisols. Mean annual air temperature of the area is 9.5°C, and the mean annual precipitation is between 500 and 620 mm. The plain is located in the transitional zone between areas of positive and negative climatic water balance (Dubicki et al., 2002). Soil pits were situated on the arable fields in the north-eastern peripheries of Wrocław, in the Pawłowice district (profiles 1 and 2) and Psie Pole district (profiles 3 and 4).

Soil morphology was described according to Guidelines (2006), and soil classification was established according to Polish Soil Classification (Komisja V Genezy, Klasyfikacji i Kartografii Gleb PTG, 2011) and the FAO-WRB classification (IUSS Working Group WRB, 2007). In each of the distinguished soil horizon, a set of disturbed and undisturbed soil samples was collected.

Particle-size distribution of the ≤2 mm fraction was conducted using sand separation on sieves and the hydrometer method for silt and clay fractions, after sample dispersion with heksametaphosphate-bicarbonate, according to standard PN-R-04032. The names of texture classes were given according to Polish Soil Science Society classification (Polskie Towarzystwo Gleboznawcze, 2009). Organic carbon was determined by dry combustion method with absorption of CO_2 using Stroelein CS MAT 5500, and the particle density was determined by picnometric method. Bulk density and water properties were assessed in undisturbed soil samples collected in the stainless steel rings (100 cm^3). Water desorption curves were determined for pF range between 0 and 2.7, using a sand block (pF 0–2.0) and the kaolin-sand block (pF 2.2–2.7). Based on the these results, the stock of plant-available water at pF 2.2 in the upper 100 cm-thick soil layer was calculated using the formula: $z = (g_1 \cdot w_1)/100 + ... + (g_n \cdot w_n)/100$, where: z – water stock, g – thickness of soil horizon (mm), w – soil moisture (% v/v) at pF 2.2.

In tables, only the mean values are displayed. Due to low number of cases (only four profiles) no specific statistical analysis was done, only the Pearson correlation coefficients (at $p<0.05$) were calculated for the entire set of samples (using Statistica 10 package).

RESULTS AND DISCUSSION

The Albeluvisols under investigation had a typical arrangement of genetic soil horizons A-Et-E/B-Bt-BC. In the soils Pawłowice 1 and 2, eluvial E horizons were poorly preserved due to erosion, deep plowing and the development of secondary *cambic* horizon. According to the Polish Soil Classification (Komisja V Genezy, Klasyfikacji i Kartografii Gleb PTG, 2011) all described soils were classified as soils lessives with glossic horizon and stagnic properties (gleby płowe zaciekowe opadowo-glejowe), due to irregular albeluvic tongues penetrating into the Bt horizon and strong redoximorphic features in the upper part of the profile. The profiles differ in the degree of penetration of the eluvial (*albic*) material into the illuvial horizon that, both on the vertical and horizontal soil sections, may be correlated with abundance, width and depth of albeluvic tongues. The tonguing intensity was much higher in the soils 2 and 3 than in the 1 and 4. The thickness of surface sandy layer in the profile Psie Pole 3 was large enough to indicate it in the soil name (Komisja V Genezy, Klasyfikacji i Kartografii Gleb PTG, 2011) at the subtype level (gleba płowa zaciekowa spiaszczona, opadowo-glejowa). According to FAO-WRB (IUSS Working Group WRB, 2007), all described soils were basically classified as Stagnic Cutanic Albeluvisols.

The soils Pawłowice 1 and 2 had the texture of sandy loam in topsoil and sandy-clay loam in subsoil. The fine sand (0.25–0.1 mm) dominated among sand fractions (2–0.05 mm) throughout the profiles, with the percentage share up to 30% in the upper horizons (Table 1). Silt (0.05–0.002 mm) content ranged between 16 and 26%, and was rather poorly differentiated throughout the profile (Pawłowice 1), or was significantly higher in the subsoil (Pawłowice 2). Clay fraction (<0.002 mm) was the most clearly differentiated in the profiles with 7–11% in the topsoil (Ap

TABLE 1. Particle-size distribution in the studiem soils

Soil profile	Horizon	Depth [cm]	Percentage of particle-size fraction									Texture class [PTG 2008]
			>2	2–1	1–0.5	0.5–0.25	0.25–0.1	0.1–0.05	0.05–0.02	0.02–0.005	<0.002	
Pawłowice 1 Stagnic Cutanic Fragic Albeluvisol (gleba płowa zaciekowa opadowo-glejowa)												
1	Ap	0–26	1	3	10	20	30	8	9	13	7	gp
	EBw	26–37	3	6	10	19	25	10	8	13	9	gp
	E/Btg	37–50	1	2	5	12	21	9	6	13	32	gpi
	2Btg/Eg1	50–75	1	2	5	11	19	14	5	14	30	gpi
	2Btg/Eg2	75–95	1	2	5	12	22	10	8	13	28	gpi
	2Btg	95–120	0	2	5	12	22	11	7	14	27	gpi
Pawłowice 2 Stagnic Cutanic Fragic Albeluvisol (gleba płowa zaciekowa opadowo-glejowa)												
2	Ap	0–40	1	3	9	20	27	12	7	15	8	gp
	EBw	40–45	2	4	9	18	25	8	10	16	11	gl
	Eg/Btg	45–55	1	2	6	13	21	12	5	13	28	gpi
	2Btg/Eg	55–80	0	2	7	15	22	12	6	10	27	gpi
	2Btg	80–120	0	2	4	15	20	13	4	12	30	gpi
Psie Pole 3 Stagnic Cutanic Fragic Albeluvisol (gleba płowa zaciekowa spiaszczona opadowo-glejowa)												
3	Ap	0–35	3	4	11	21	33	14	5	9	3	ps
	Eg	35–55	4	4	13	24	31	10	6	9	3	pg
	Eg/Btg	55–65	2	5	18	29	29	9	3	6	1	ps
	2Btg/Eg	65–115	1	2	5	22	23	15	8	19	6	gp
	2Btg	115–150	4	2	5	20	27	15	6	8	17	gp
Psie Pole 4 Stagnic Cutanic Fragic Albeluvisol (gleba płowa zaciekowa opadowo-glejowa)												
4	Ap	0–30	2	3	8	19	35	17	6	7	5	pg
	Eg	30–45	1	3	8	19	34	16	5	8	7	pg
	2Btg/Eg	45–70	1	2	6	16	31	16	5	6	18	gp
	2Btg	70–120	1	2	6	20	34	17	5	3	13	gp

Explanation: ps – sand (piasek słabogliniasty), pg – loamy sand (piasek gliniasty), gp – sandy loam (glina piaszczysta), gl – sandy loam (glina lekka), gpi – sandy clay loam (glina piaszczysto-ilasta).

and E or EBw horizons) and 27–32% in the subsoil. The abrupt change in clay content was accompanied by the occurrence of gravelly periglacial pavement that argued for the lithological discontinuity between soil materials in the surface and subsurface horizons. The profiles Psie Pole 3 and 4 differ in texture that was sandy in topsoil (sand or loamy sand) and loamy (sandy loam) in the subsoil. Moreover, fine sand (0.25–0.1 mm) predominated among sand fractions (up to 35%) in these soils. However, the share of medium sand was similarly high (up to 29% in the profile 3). The content of silt was generally low (even less than 10%) and uniform in the profile 4, whereas clearly differentiated between E and Bt horizons in the profile 3. The share of clay in the upper horizons ranged between 1 and 7%, and rapidly increased in the illuvial horizons, up to 18%. The lithological discontinuity (Komisja V Genezy, Klasyfikacji i Kartografii Gleb PTG, 2011, IUSS Working Group WRB, 2007) was recognized in all four profiles on the contact between eluvial and illuvial horizons. It may result from a selective denudation of the surface till layer and further colluvial, fluvial or eolian accumulation of the covering materials (mainly sands). This kind of parent material stratification or welding seems to be very common in Albeluvisols in the postglacial areas of the central and northern Europe (Kühn, 2003).

Bulk density of the undisturbed soil samples were in a wide range between 1.51 and 1.91 g cm^{-3} (Table 2). Clear differences between soil horizons were observed in each of examined soil profiles. The lowest values (1.51–1.69 g cm^{-3}) occurred in the surface horizons due to the regular tillage and correlation (Table 3) to organic matter content (Bogacz et al., 2008; Kaczmarek et al., 2006). The highest bulk density values were recorded in EBw horizons (Pawłowice 1 and 2) or in E/Bt horizons (Psie Pole 3 and 4). In the first case it may be a result of the "plow sole" formed directly under the plough layer (Marcinek et al., 1995; Zaleski, 2012). High mean bulk density of E/Bt horizons (profile 3 and 4) that was despite the presence of sandy tongues with generally lower density, indicates the high compaction and density of the loamy

TABLE 2. Selected physical and water properties pf soils

Soil profile	Horizon	Depth (cm)	Bulk density $(g\ cm^{-3})$	Particle density $(g\ cm^{-3})$	Total porosity $(m^3\ m^{-3})$	Organic carbon $(g\ kg^{-1})$	pF (% v/v)						Water storage in 100 cm layer (mm)
							0	1.0	2.0	2.2	2.5	2.7	
Pawłowice 1 Stagnic Cutanic Fragic Albeluvisol (gleba płowa zaciekowa opadowo-glejowa)													
1	Ap	0–26	1.66	2.55	0.36	13.8	35.9	34.3	27.7	26.4	22.9	21.7	303
	EBw	26–37	1.91	2.65	0.28	4.30	30.5	29.0	24.6	23.2	20.0	18.7	
	E/Btg	37–50	1.83	2.55	0.28	1.80	42.2	40.8	37.7	36.4	33.0	31.6	
	2Btg/Eg1	50–75	1.74	2.60	0.33	1.10	40.3	38.8	35.9	34.8	32.3	31.1	
	2Btg/Eg2	75–95	1.69	2.62	0.35	1.10	40.7	38.7	33.2	29.8	21.7	19.7	
	2Btg	95–120	1.66	2.63	0.37	1.20	38.2	36.7	32.0	29.0	22.5	20.2	
Pawłowice 2 Stagnic Cutanic Fragic Albeluvisol (gleba płowa zaciekowa opadowo-glejowa)													
2	Ap	0–40	1.69	2.60	0.31	7.20	30.0	29.1	25.0	24.0	20.6	19.9	282
	EBw	40–45	1.85	2.62	0.29	3.60	28.3	27.1	24.3	22.8	20.1	18.9	
	Eg/Btg	45–55	1.84	2.62	0.30	3.10	40.4	37.3	30.9	29.4	25.6	24.6	
	2Btg/Eg	55–80	1.70	2.61	0.35	1.20	37.9	36.7	33.8	32.6	29.8	28.8	
	2Btg	80–120	1.69	2.59	0.35	1.10	38.7	37.2	33.2	32.0	23.7	22.7	
Psie Pole 3 Stagnic Cutanic Fragic Albeluvisol (gleba płowa zaciekowa spiaszczona opadowo-glejowa)													
3	Ap	0–35	1.51	2.61	0.42	8.50	37.2	34.8	17.2	16.6	12.1	11.4	181
	Eg	35–55	1.67	2.65	0.37	2.10	29.3	26.9	14.5	13.4	9.8	8.8	
	Eg/Btg	55–65	1.66	2.64	0.37	0.80	27.9	25.9	19.1	18.8	16.1	15.0	
	2Btg/Eg	65–115	1.82	2.63	0.31	0.40	35.4	33.0	23.7	22.2	17.5	16.4	
	2Btg	115–150	1.81	2.63	0.31	0.40	37.5	35.2	30.7	29.1	26.3	23.8	
Psie Pole 4 Stagnic Cutanic Fragic Albeluvisol (gleba płowa zaciekowa opadowo-glejowa)													
4	Ap	0–30	1.58	2.61	0.40	7.10	35.4	32.7	20.7	19.2	14.4	13.5	221
	Eg	30–45	1.79	2.66	0.33	1.00	29.6	26.9	19.1	18.0	14.9	13.9	
	2Btg/Eg	45–70	1.83	2.64	0.31	0.50	34.2	32.5	26.6	25.0	21.0	20.1	
	2Btg	70–120	1.75	2.64	0.34	0.30	35.6	33.1	26.0	24.6	20.7	19.3	

peds in the upper part of an illuvial horizon. The peds meet requirements for *fragic* material; however, a *fragic* horizon was distinguished not in the upper but in the lower part of Bt horizon – due to an excessive volume of cracks/tongues. It should be noted that the bulk density in E/Bt horizons in soils 3 and 4 was in general lower than this in the profiles 1 and 2, due to differences in texture, especially lower content of clay fraction, but also larger volume of eluvial (sandy) tongues. Particle density of investigated soils ranged from 2.55 to 2.66 g cm^{-3} and was the highest in the eluvial horizons, between 2.62 and 2.66 g cm^{-3} (Table 2), e.g. due to negative relationship to organic carbon and clay contents (Table 3).

Values of total porosity, calculated on the basis on particle density and bulk density ranged between 0.28 to 0.43 m^3 m^3 and were significantly diversified within the soil profiles (Table 2) with no simple dependence on organic matter or clay content (Table 3). The highest values of total porosity were recorded in the humus Ap horizons of all profiles, and in the illuvial Bt horizons of soils Pawłowice 1 and 2. Obtained results of total porosity, contrary to the commonly accepted assumption (Walczak, 1984), differed partly from the maximum retentive capacity. However, reported difference may result from the inconsistency of measurement methods. Maximum retentive capacity (at pF=0) was directly determined after capillary rise to the state of full saturation, while the total porosity was calculated on the basis of the specific gravity and bulk density. This difference may be especially visible in the soils with high content of the swelling clay minerals (Paluszek, 2011). High values of the total porosity in some E/Bt horizons of soils under study are also contrary to the results obtained in other Luvisols (Marcinek and Komisarek, 2004). This may result from the larger share of sandy infilling of tongues that influences the mean result of the measurements.

Soil moisture (expressed in volume percent) in most genetic horizons, in particular in the illuvial horizons, was at consecutive pF values higher in the profiles Pawłowice 1 and 2 as compared to Psie Pole 3 and 4 (Table 2), probably due to strong positive correlation with clay content (Table 3). However, in the loamy-textured humus A horizons (Pawłowice 1 and 2), the moisture corresponding to the maximum water capacity (pF=0) was 30–36% v/v, that was similar to the values recorded in the sandy-textured A horizons of the soils Psie Pole 3 and 4 (35–37% v/v). Also, there were no significant differences in moisture at pF=0 in the sandy- and loamy-textured E and EBw horizons. But in E/Bt horizons, the moisture at pF=0 was clearly higher in the finer-textured soils Pawłowice 1 and 2 (Table 2). The most important for agricultural use, a field water capacity (at pF=2.2), ranged in humus A horizons between 16.6 and 26.4% and was higher in Pawłowice 1 and 2 soils by at least one fourth. The highest values were observed in the E/Bt horizons – up to 36.4% (Pawłowice 1 and Psie Pole 4) or in the illuvial horizons Bt/E with various share of albeluvic tongues – up to 32.6% (Pawłowice 2 and Psie Pole 3). The best ability of water storage in soil was strongly correlated with content of colloidal clay fraction, even when these horizons are dissected by tongues of *albic* material. However, in the profiles where penetration of albeluvic tongues into the illuvial horizons are very intensive, the highest average content of clay fraction and moisture at pF=2.2 were in the deeper parts of B-horizon (like in the soil Pawłowice 2), sometimes at the depth 100 cm or deeper (Psie Pole 3).

Both the maximum and field water capacity in A, E, and Bt horizons of Luvisols developed of glacial materials vary in a very broad ranges, and our results are similar to these given by other authors for Luvisols with similar lithological discontinuities (Kaczmarek, 2001; Kobierski and Dąbkowska-Naskręt, 2002; Komisarek and Szałata, 2008; Marcinek et al., 1995; Paluszek, 2011; Walczak et al., 2002b). This can be interpreted either as (1) a prevailing importance of textural differentiation, not a tonguing, for the water capacity of Luvisols and Albeluvisols, or (2) the result of common analyzing of all clay-illuviated soils without distinguishing the Albeluvisols from the Luvisols. Walczak et al. (2002b) have proposed dividing of arable soils in three classes based on the field water capacity. According to this classification, the investigated soils belong to the second class – soils with medium values of field water capacity (0.2–0.3 m^3 m^3).

Based on the field water capacity, the stock of easily available water (at pF=2.2) in a 100 cm thick soil column was calculated (Table 2). The water stock in soils Pawłowice 1 and 2 was clearly higher indicating larger ability for water retention at field capacity. Potentially, these soils can store 282–303 mm of water, whereas the soils Psie Pole 3 and 4 between 181 and 221 mm (Table 2). Among the analyzed Albeluvisols, the highest potential stock of easily available water was determined in the profile 1, where the thickness of covering, coarser-textured material is shallow and the intensity of dissecting with albeluvic tongues is relatively lowest. Contrary, the lowest stock of water retention was found in the profile 3, due to the highest thickness and coarse texture of eluvial and humus horizons, as well as high share of *albeluvic* tongues in the illuvial horizon. This situ-

TABLE 3. Coefficients of Pearson correlation for the entire data set (coefficients significant at $p<0.05$ are marked with *)

	d_w	por	Corg	pF0	pF2.2	pF2.7	silt	clay
dv	0.21	-0.95*	-0.45*	-0.08	0.27	0.39	0.08	0.25
dw		0.00	-0.52*	-0.53*	-0.55*	-0.56*	0.26	-0.36
por			0.31	0.04	-0.40	-0.50*	-0.01	-0.30
Corg				-0.09	-0.24	-0.20	-0.04	-0.41
pF0					0.77*	0.64*	0.07	0.78*
pF2.2						0.88*	-0.14*	0.91*
pF2.7							-0.15	0.82*
silt								-0.15

Explanation: d_v – bulk density, d_w – specific gravity, por – total porosity, Corg – organic carbon, pF0, pF2.2, pF2.7 – water capacity at given pF value.

ation is aggravated by intensive penetration of albeluvic tongues into the loamy B-horizon. Identified water stocks in examined profiles of Albeluvisols varied significantly, but were within wide range of values reported for Albeluvisols with texture differentiation in soil profile (Kaczmarek et al., 2006). Easily available water stock is the result of both variable texture and thickness of the soil horizons, in particular in soils with preserved distinct differentiation on the eluvial and illuvial zones within the profile (Zaleski, 2012). The most important feature influencing water retention in the Luvisols/Albeluvisols with lithological discontinuity seems to be the depth of occurrence of the loamy iluviall horizon and the mean clay content in the illuvial horizon (including mixed E/B or B/E horizons). Profiles with finer-textured Bt horizons (clay content 27–32%) under thinner layer of covering materials had much higher water retention properties than these with coarser- textured Bt horizons (clay content 6–18%) overlaid by thicker cover sands.

Moreover, this study showed, which wasn't earlier commented more widely in the Polish soils, that for the proper estimation of the water storage in the Albeluvisols (soils with an argic horizon and albeluvic tonguing) important are the characteristics of E/Bt and B/E horizons, e.g. their thickness and share (volume percentage) of albeluvic tongues in the transition/illuvial horizons. Due to the small thickness and complex (polygonal) character of albeluvic tongues, it is impossible to collect separate samples of undisturbed eluvial and illuvial soil material from E/Bt and Bt/E horizons. Larger number of replications (collected in various sites of mixed horizon) has, therefore, extreme importance for proper estimation of bulk density and water properties of E/Bt and Bt/E horizons of the Albeluvisols.

CONCLUSIONS

1. Water storage at field water capacity in Albeluvisols with lithological discontinuity is mainly determined by texture variability and the thickness of eluvial (A+Et) and iluvial (E/B+Bt+BC) zones, and may not differ from those in Luvisols with similar textural differentiation
2. Water capacity in glossic E/Bt horizons of Albeluvisols depends on the intensity of eluvial material penetration into the illuvial horizon, which is related to abundance, width and depth of albeluvic tongues on the horizontal and vertical cross-sections.
3. Field water capacity of illuvial horizons largely dissected by albeluvic tongues (Bt/E) is the highest in the deeper part of horizon, below the zone of very intensive albeluvic tonguing.

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Fizyczne i wodne właściwości gleb płowych zaciekowych Dolnego Śląska

Streszczenie: Skład granulometryczny, gęstość objętościowa i właściwa, porowatość całkowita, pojemność wodna w zakresie pF 0–2.7 oraz zapas wody użytecznej w profilu przy pF 2.2 zostały określone w glebach płowych, zaciekowych z silniej lub słabiej zaznaczoną nieciągłością litologiczną w profilu. Profile glebowe zlokalizowane zostały w północno-wschodniej części Niziny Śląskiej, na równinie denudacyjnej, gdzie na powierzchni glin moreny dennej zlodowacenia Odry powszechnie występują utwory pokrywowe różnej genezy, głównie piaski. We wszystkich badanych profilach występują zacieki materiału albic o uziarnieniu piaszczystym w stropie gliniastego poziomu iluwialnego, a także silne oglejenie odgórne na styku poziomów eluwialnych i iluwialnych oraz w poziomach iluwialnych. Najniższe wartości gęstości objętościowej stwierdzono w poziomach ornych, natomiast najwyższe w podornych poziomach EBw lub w zaciekowych poziomach E/Bt. Całkowita porowatość jest największa w poziomach ornych, następnie skokowo maleje w poziomach E i na powrót rośnie z głębokością. Pojemność wodna (przy każdej mierzonej wartości pF) jest najsilniej skorelowana z zawartością iłu i skokowo rośnie w poziomach E/Bt. Najwyższa pojemność wodna przy pF 2.2 występuje w poziomie E/Bt, przy niewielkiej liczebności zacieków poziomu eluwialnego albo w głębszych częściach poziomu Bt, w przypadku dużej intensywności wnikania zacieków eluwialnych w strop poziomu iluwialnego. Zapas wody (przy polowej pojemności wodnej) w górnej, 100 cm warstwie gleb płowych zaciekowych z nieciągłością litologiczną, zależy od głębokości styku strefy eluwialnej i iluwialnej, podobnie jak w glebach płowych typowych z podobnym zróżnicowaniem uziarnienia w obrębie profilu glebowego.

Słowa kluczowe: gleby płowe zaciekowe, właściwości wodne, skład granulometryczny, nieciągłość litologiczna