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EWA BŁOŃSKA*, JAROSŁAW LASOTA, KAZIMIERZ JANUSZEK

Agriculture University, Forest Soil Department, Al. 29 Listopada 46, Kraków, Poland

Variability of enzymatic activity in forest Cambisols and Brunic Arenosols of Polish lowland areas

Abstract: The aim of this study was to determine the enzymatic activity (dehydrogenase and urease) in trophically diverse Brunic Arenosols and Cambisols. Efforts to establish the relationship between enzymatic activity and physico-chemical properties of various subtypes of Brunic Arenosols and Cambisols were attempted. Another aim was to determine the effect of vegetation on the properties of soil surface levels. The study was conducted on 94 plots located in nature reserves and national parks in the Polish lowland area. Dehydrogenase activity and urease showed large variations in the subtypes of the distinguished Brunic Arenosols and Cambisols. Dehydrogenases and urease activity in surface layers of fresh humus of Cambisols and Brunic Arenosols was strongly associated with the plants. This is confirmed by the relationship between the enzymatic activity and the type of accumulated humus substances, the ratio of carbon to nitrogen and humus horizons reaction.

Key words: dehydrogenase and urease activities, forest Cambisols and Brunic Arenosols

INTRODUCTION

Brunic Arenosols and Cambisols dominating in Polish forests are covered with forest stands of different species composition. Brunic Arenosols underlie the substrate of different habitats depending on the parent material from which they developed and specific physico-chemical properties. The same situation applies to Cambisols. In the case of the Cambisols the parent materials are mostly boulder clays , silts of various origins, loess, weathered sandstone and shale of different origins. Brunic Arenosols are associated with decalcificated sands (Classification of Polish Forest Soils, 2000).

The aim of this study was to compare the bio-physico-chemical properties of different subtypes of Brunic Arenosols and Cambisols. The relationship between physicochemical properties and enzymatic activity of soils was searched for. Attempts were made to determine the effect of vegetation on the properties of soil surface horizons.

MATERIAL AND METHODS

The study was conducted in 94 areas, located in nature reserves and national parks of Polish lowland area. The material consists of different subtypes of forest Brunic Arenosols and Cambisols: Hyperdystric Cambisols (BRk) – 9 plots, Eutric Cambisols (BRw) – 2 plots, Epidystric Cambisols (BRwy) – 11 plots and Albic Brunic Arenosols (RDb) – 22 plots, Cambic Brunic Arenosls (RDbr) – 26 plots and Haplic Brunic Arenosols (RDw) – 24 plots. From the surface horizons the samples were taken in order to mark the basic soil properties. In the samples pH – with the potentiometric method (in water and 1M KCl), total nitrogen content and organic carbon content with LECO aparatus, including calculation of C/N ratio, the content of alkaline cations – in 1M ammonium acetate (ICP-OES apparatus) and available phosphorus – with the Bray-Kurtz method were determined. The plant habitats were classified in the forest on the basis of structure and composition of species (Matuszkiewicz, 2001).

For the determination of enzyme activity the fresh samples of natural moisture were collected. The average samples made for an mixed sample of soil from the pit and four seats around it. The enzyme activity was determined at the first horizon of soil covered with litter, which had the humus form (Ofh) or mineral humus horizon (A). Depending on the type of soil humus Brunic Arenosols were divided into two groups which were analyzed separately. The first includes the profile of the surface organic horizon (Ofh), the second group consisted of surface mineral humus horizon (A). Dehydrogenase activity was determined with Lenhard's method according to the Casida procedure (1964). Urease activity was determined with the use of the method Tabatabai and Bremner (1972 in: Alef and Nannipieri, 1995)

*e-mail: eblonska@ar.krakow.pl

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RESULTS

Albic Brunic Arenosols were formed mainly from glacial sands less often from aeolian and boulder sands. Among the parent materials of Haplic Brunic Arenosols and Cambic Brunic Arenosols dominated boulder sand and glacial sands. The sands and boulder clays, silts and loess formed the bedrock of Hyperdystric Cambisols were formed. Eutric Cambisols were formed from sands on boulder clays and alluvial deposits. In the case of Epidystric Cambisols the bedrock was formed from glacial sands on boulder clays, sands and boulder clays and loess. Type of forest humus, which is formed in the analyzed Brunic Arenosols is associated with the plant communities that grow on the of defined soil. The humus horizon develops in the absolute majority of cases in fresh coniferous forests (*Leucobryo-Pinetum*, *Peucedano-Pinetum*) or mixed coniferous forest (*Querco roboris-Pinetum, Serratulo-Pinetum*). Single cases of occurrance of organic overburden (Ofh) in Brunic Arenosols all subtypes are found in acidophilic deciduous forests (*Luzulo pilosae-Fagetum, Fago-Quercetum, Calamagrostio arundinaceae-Quercetum*) or *Tilio-Carpinetum calamagrostietosum* or *Potentillo albae-Quercetum.* Mull humus type where under the horizon of litter occurred the mineral humus horizon (A) developed mainly in deciduous forests. On the Brunic Arenosols with mull humus type grew floristically rich oak-hornbeam forest communities (*Tilio-Carpinetum typicum, Stellario-Carpinetum typicum*) and fertile lowland beech forest (*Galio odorati-Fagetum*), with a lower frequency occurred acidophilous deciduous forests (*Luzulo pilosae-Fagetum, Fago-Quercetum, Calamagrostio arundinaceae-Quercetum*) and *Potentillo albae-Quercetum.* The humus mineral horizon in the mixed coniferous forests directly under the litter was noted occasionally. In Cambic Brunic Arenosols the mull humus was found with similar frequency in each plant community. In Albic Brunic Arenosls that type of humus developed unique in oak-hornbeam forests or poor acidophilous deciduous forests. The Cambisols accompanied mainly deciduous forests. Hyperdystric Cambisols were described in fertile and poor subtypes of oak-hornbeam forests (*Tilio-Carpinetum typicum, Tilio-Carpinetum calamagrostietosum*) in the fertile lowland beech forests (*Galio odorati-Fagetum*) and in the poor beech forests (*Luzulo pilosae-Fagetum*) and also in *Potentillo albae-Quercetum, Fago-Quercetum* and in a highland area in the *Tilio-Carpinetum abietetosum* and in upland mixed coniferous forest (*Abietetum polonicum*). Epidystric Cambisols were covered mainly by *Tilio-Crpinetum typicum, Stellario-carpinetum typicum* and fertile lowland beech forests (*Galio odorati-Fagetum*) and *Potentillo albae-Quercetum* rarely by *Tilio-Carpinetum abietetosum* and poor beech forests (*Luzulo pilosae-Fagetum*). Most rarely seen Eutric Cambisols formed sites of floristically rich typical and *Tilio-Carpinetum abietetosum.*

The described Cambisols and Brunic Arenosols differed in bio-physico-chemical properties in the surface horizon of humus accumulation. The highest pH at this horizon in the case of Cambisols was recorded in the Eutric Cambisols (median pH in H_2O 5.24), the lowest in the Hyperdystric Cambisols (median pH in H_2O 4.34). The surface mineral humus horizon of Haplic and Cambic Brunic Arenosols were characterized by the highest pH (median pH in H_2O 4.48). The surface organic humus horizon of Albic Brunic Arenosls was characterized by the lowest pH (median pH in H_2O 3.80) (Table 1 and 2). The described soils showed differences in the content of C, N and the C/N. Eutric Cambisols were characterized by the highest content of carbon and nitrogen in the surface horizon (median content C = 6.36, N = 0.45), and the lowest content was noted in Epidystric Cambisols (median content C = 4.42, N = 0.23). Surface horizons of Eutric Cambisols showed the best rate of decomposition of organic matter which confirms the C/N ratio equals 14. In the case of Brunic Arenosols the lowest average C/N ratio equals 21 occurred in the surface mineral humus horizon in Cambic Brunic Arenosols. The subtypes of Cambisols and Brunic Arenosols clearly differed in base saturation (Vs). Eutric Cambisols were characterized by the highest Vs (Vs = 46%) and Hyperdistric Cambisols were characterized by the lowest Vs (Vs = 12%). In the surface mineral humus horizon of Haplic Brunic Arenosols the highest base saturation (Vs = 17%) and lowest in the Albic Brunic Arenosols (Vs = 5%) were marked.

Using the non-parametric Kruskal-Wallis test a statistically significant difference in the properties of the soils in different subtypes was noted. In the case of surface horizons of Cambisols significant differences in the C/N ratio, hydrolytic acidity and exchangeable acidity, the aluminum content, pH in H_2O and KCl and Ca content (Table 3) were observed. In the surface mineral humus horizon of Brunic Arenosols significant differences in pH in H_2O and KCl (Table 2) were noted. The highest median of dehydrogenase activity 39.22 mmol TFF·1kg^{-1}·h^{-1} was noted in the surface horizon of Epidystric Cambisols, the lowest in the Eutric Cambisols 29.42 mg mmol TFF·1kg^{-1}·h^{-1}. The highest urease activity was

TABLE 1. Statistical characteristic properties of surface organic horizons of Brunic Arenosols

		RDb			RDw			RDbr			Kruskal-Wallis test	
		median	min	max	median	min	max	median	min	max	H	p-value
Organic C	%	34.02	13.13	46.73	28.86	11.69	33.10	18.58	15.13	26.34	5.2420	0.0727
Total N		1.06	0.42	2.72	0.89	0.45	1.37	0.77	0.50	1.07	1.9678	0.3738
C/N		28	17	40	26	23	34	25	23	30	1.5641	0.4575
Y	cmol(+)·kg^{-1}	74.74	33.48	109.92	72.71	35.14	111.48	49.71	40.15	72.79	2.7704	0.2503
H_w		7.84	3.06	19.32	9.24	3.59	18.76	5.97	3.12	9.24	2.0987	0.3501
H_{Al}		5.18	2.41	15.96	6.58	2.66	17.97	3.80	1.93	8.40	3.1988	0.2020
Vs	%	13	4	19	10	4	17	15	8	19	2.6543	0.2652
pH in H_2O		3.94	3.43	4.90	3.80	3.44	4.21	3.98	3.74	4.37	0.7994	0.6705
pH in KCl		2.93	2.58	3.72	2.89	2.63	3.39	3.06	2.84	3.35	0.9649	0.6172
Ca	mg·kg^{-1}	139.08	31.22	251.14	91.17	64.05	191.41	131.05	36.75	283.48	2.7407	0.2540
K		33.69	14.02	102.85	23.61	17.88	47.64	28.29	20.22	47.66	2.5747	0.2760
Mg		15.25	5.78	30.69	10.93	6.67	19.57	13.61	10.89	27.38	4.0344	0.1330
Na		2.50	1.05	6.63	2.05	0.85	3.19	1.76	1.60	2.64	2.4073	0.3001
P		15.82	7.91	58.52	13.72	1.09	22.96	13.62	9.80	20.51	2.6202	0.2698
Urease activity mmol N-NH_4·1kg^{-1}·h^{-1}		0.33	0.03	1.71	0.33	0.04	0.71	0.49	0.45	0.51	1.0736	0.5846
Dehydrogenase activity mmol TFF·1kg^{-1}·h^{-1}		29.31	2.60	84.85	25.07	3.03	71.89	37.64	27.32	67.35	1.6105	0.4470

Explanations: RDb – Albic Brunic Arenosols, RDw – Haplic Brunic Arenosol, RDbr – Cambic Brunic Arenosols, Y – hydrolytic acidity, H_w – exchangeable acidity, H_{Al} – exchangeable aluminum, Vs – base saturation.

TABLE 2. Statistical characteristic properties of mineral-humus horizons of Brunic Arenosols

		RDb			RDw			RDbr			Kruskal-Wallis test	
		median	min	max	median	min	max	median	min	max	H	p-value
Organic C	%	2.49	1.82	3.95	4.65	1.84	10.27	3.55	1.16	9.41	3.1399	0.2081
Total N		0.11	0.09	0.17	0.20	0.07	0.39	0.18	0.06	0.38	2.5565	0.2785
C/N		22	20	24	22	15	38	20	15	27	2.6464	0.2663
Y	cmol(+)·kg^{-1}	9.47	6.27	18.51	13.59	5.74	36.00	9.09	3.90	34.89	3.6580	0.1648
H_w		4.26	1.88	5.51	2.99	0.93	8.51	2.14	0.11	7.81	2.0241	0.3635
H_{Al}		4.04	1.74	5.05	2.78	0.73	7.34	1.92	0.08	7.39	2.6871	0.2609
Vs	%	5	3	6	17	2	50	14	3	59	4.5662	0.1020
pH in H^2O		3.90	3.83	4.14	4.48	3.73	5.12	4.48	3.92	5.88	6.3385	0.0420
pH in KCl		3.07	3.03	3.13	3.60	2.80	4.05	3.57	3.26	5.12	7.4030	0.0247
Ca	mg·kg^{-1}	5.26	3.84	6.09	20.09	3.12	142.81	41.58	2.62	185.97	4.3578	0.1132
K		3.94	3.75	4.16	5.27	3.40	27.00	8.20	1.45	19.25	2.6238	0.2693
Mg		1.52	1.03	1.76	2.60	0.73	14.09	3.79	0.52	15.41	2.1443	0.3423
Na		0.47	0.39	0.71	0.80	0.23	1.84	0.58	0.16	1.51	2.5645	0.2774
P		14.00	2.56	44.17	17.01	5.25	111.72	12.15	1.47	79.66	1.7522	0.4164
Urease activity mmol N-NH_4·1kg^{-1}·h^{-1}		0.19	0.06	0.70	0.36	0.10	0.87	0.43	0.00	0.79	22.34	1.3615
Dehydrogenase activity mmol TFF·1kg^{-1}·h^{-1}		42.15	13.67	43.04	44.91	16.59	159.07	52.16	0.00	92.56	66.59	2.0579

Explanation as in Table 1.

TABLE 3. Statistical characteristic properties of Cambisols

		BRk			BRwy			BRw			Kruskal-Wallis test	
		median	min	max	median	min	max	median	min	max	H	p-value
Organic C	%	5.48	1.63	11.31	4.42	2.90	13.07	6.37	5.41	7.32	9.1989	0.0563
Total N		0.21	0.09	0.79	0.23	0.16	0.61	0.45	0.41	0.48	8.7892	0.0666
C/N		18	14	26	21	14	25	14	13	15	9.7473	0.0449
Y	cmol(+)·kg^{-1}	16.02	6.20	25.16	14.43	7.45	36.60	14.46	10.73	18.20	10.2914	0.0358
H_w		3.15	1.57	8.47	2.62	0.91	7.58	1.66	0.46	2.85	11.5807	0.0208
H_{Al}		2.39	0.00	7.98	2.41	0.75	7.23	1.51	0.35	2.67	9.5209	0.0493
Vs	%	12	5	48	18	10	29	46	27	65	14.2430	0.0660
pH in H_2O		4.53	3.76	5.13	4.37	3.90	4.98	5.25	5.04	5.45	13.7053	0.0083
pH in KCl		3.55	2.94	4.15	3.46	3.07	4.02	4.33	4.10	4.56	13.3153	0.0098
Ca	mg·kg^{-1}	30.37	10.11	275.94	50.97	27.06	92.48	227.53	121.16	333.90	12.6946	0.0129
K		12.30	2.49	83.63	11.41	6.16	30.40	13.89	7.63	20.15	6.5344	0.1626
Mg		4.78	1.40	71.37	5.23	3.21	15.39	21.25	7.62	34.87	5.0720	0.2800
Na		0.69	0.48	2.21	0.75	0.32	1.41	1.02	0.78	1.26	5.6021	0.2309
P		10.50	3.96	43.09	15.88	3.71	132.86	3.87	2.14	5.60	4.0731	0.3962
Urease activity mmol N-NH^4·1kg^{-1}·h^{-1}		0.28	0.07	0.81	0.29	0.13	0.73	0.46	0.29	0.62	22.34	1.3615
Dehydrogenase activity mmol TFF·1kg^{-1}·h^{-1}		31.49	4.41	62.13	39.22	2.89	167.96	29.42	21.86	36.97	66.59	2.0579

Explanations: BRk – Hyperdystric Cambisols, BRwy – Epidystric Cambisols, BRw – Eutric Cambisols, Y – hydrolytic acidity, H_w – exchangeable acidity, H_{Al} – exchangeable aluminum, Vs – base saturation.

noted in the Eutric Cambisols (median 0.46 mmol N-NH_4·1 kg^{-1}·h^{-1}) and the lowest in the Hyperdystric Cambisols (median 0.28 mmol N-NH_4·1kg^{-1}·h^{-1}) (Table 2). In the case of surface mineral humus horizons of Brunic Arenosols the highest urease activity (median 0.43 mmol N-NH_4·1kg^{-1}·h^{-1}) and dehydrogenase (median 52.16 mg mmol TFF·1kg^{-1}·h^{-1}) was observed in Cambic Brunic Arenosols, and the lowest activity of the marked enzymes in Albic Brunic Arenosols. In the surface organic horizons of Brunic Arenosols the highest urease activity (median 0.49 mmol N-NH_4·1kg^{-1}·h^{-1}) and dehydrogenase (median 37.64 mmol TFF·1kg^{-1}·h^{-1}) was observed in Cambic Brunic Arenosols and the lowest activity was marked enzymes in Albic Brunic Arenosols (Table 1). Non-parametric Kruskal-Wallis test indicates a statistically significant difference in the activity of dehydrogenases between the subtypes of Cambisols (Table 3).

DISCUSSION

The described soils were characterized by diverse properties of soils. In the surface horizons of Brunic Arenosols and Cambisols statistically significant differences were observed in the physico-chemical and biochemical properties between the subtypes of soils. According to Acosta-Martínez et al. (2007) the enzymatic activity is associated with the parent material from which the soil develops. A similar geological substrate characterized Cambic Brunic Arenosols and Epidystric Cambisols which probably resulted in a similar urease and dehydrogenase activity. Glacial and boulder sands and in the case of Cambisols lying on loam sands, which are parent materials of these soils are a powerful substrate and in deep horizons they may contain carbonates. Soils built from that parent materials accompanied mixed broadleaf forest and broadleaf forest sites. Fertility diagnosis of sites can be possible on the basis of sustainable elements of environmental soil which includes parent material mainly with its abundance (Mąkosa, 1992; Mąkosa et al., 1994). Lasota (2005) believes that it is impossible to assess the quality of soil ignoring the deeper horizons because they are often a kind of „reservoir" of nutrients, which also determine the fertility of forest soils. Januszek et al. (2006) evaluated the fertility of Epidystrict Cambisols which were formed by sandstone and shale of Magura flysch leyers and under influence of different plant communities. Based on the research came to the conclusion

that enzyme activity is a good indicator of forest soil fertility. Myśków et al. (1996) developed a biological indicator of soil fertility using the biological activity expressed by the activity of dehydrogenases or alkaline phosphatase. Kucharski (1997) and Januszek (1999) used dehydrogenase and urease activity for estimation of soil. Following this study a sequence of subtypes of Brunic Arenosols and Cambisols (in humus mineral horizon A) according to the increasing activity of dehydrogenases and urease was established. In the case of urease activity subtypes of the soils are arranged as follows: RDb<BRk<BRwy<RDw<BRw<RDbr. Dehydrogenase activity turned out to be less useful in the assessment of soil fertility of tested soil subtypes. Dehydrogenase activity is lowest in the organic horizons of Brunic Arenosols and clearly increases in the humus mineral horizons of Brunic Arenosols and Cambisols but it poorly differentiates them. Urease and dehydrogenase activity differed between subtypes of Brunic Arenosols and Cambisols. Both in the case of subtypes Cambisols and Brunic Arenosols enzyme activity in the humus horizons was related to the properties of soil and the type of vegetation covering the soil tested. The lowest level of dehydrogenase and urease activity was observed in Albic Brunic Arenosols covered mainly by coniferous forests and mixed coniferous forests. The highest activity of enzymes studied showed the humus horizons of Cambic Brunic Arenosols under the rich floristically oak-hornbeam and beech forests. Brunic Arenosols are characterized by intermediate levels of enzyme activity which is associated with the occurrence of these soils in oak-hornbeam, beech forest, acidophilous oak forests but also in mixed coniferous forests. Dehydrogenase activity in Brunic Arenosols correlated with pH. Trevors (1984), Bielińska and Wiśniewski (2004) and Rusek (2006) on the basis of their research came to the conclusion that the activity of dehydrogenases decreases with the lowering pH of the soil. Brzezińska et al. (2001) observed the maximum dehydrogenase activity at pH 6.6–7.2. In the study a correlation between the activity of dehydrogenase and the ratio of C/N in the Cambisols was also noted. Callesen et al. (2007) found that the C/N ratio is an indicator of the quality of litter and temperature of its distribution, the state of the nitrogen in the soil. These authors correlated C/N ratio with soil texture (fine, medium grained, coarse grained). C/N ratio was extensive in the organic horizon of soils with coarse and medium grained texture. At a deeper horizon there were no significant differences in the C/N ratio in the studied types of textures.

CONCLUSIONS

1. Activity of dehydrogenases and urease showed high diversity in the surface horizons of studied subtypes of Brunic Arenosols and Cambisols. The value of average activity increases with the improvement of trophic condition of further subtypes of soils.
2. Dehydrogenase and urease activity in surface humus horizons of fresh Cambisols and Brunic Arenosols showed a strong relationship with the plant communities, which is reflected in the activities linked to the type of accumulated organic matter, the ratio of carbon to nitrogen and reaction of humus horizon.
3. The increased activity of dehydrogenases and urease with increasing floristic richness plant communities growing on tested Brunic Arenosols and Cambisols implies a relationship of microbial and enzymatic activity with the composition of soil organic matter, a kind of root exudates of higher plants that inhabit the forests soil and microbiological diversity.

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REFERENCES

Acosta-Martínez V., Cruz L., Sotomayor-Ramírez D., Pérez-Alegría L., 2007. Enzyme activities as affected by soil properties and land use in a tropical watershed. *Applied Soil Ecology* **35**(1): 35–45.

Alef K., Nannipieri P., 1995. Enzyme activities. [In:] Methods in applied Soil Microbiology and Biochemistry (Alef K., Nannipieri P., Eds.). Academic Press, London, New York, San Francisco.

Bielińska E.J., Wiśniewski J., 2004. The use of enzymatic tests to assess the inhibit factors of degradation process of the soil in the cultivation of tobacco. *Annales UMCS, Sect. E* **59**(1): 29–35.

Brzezińska M., Stępniewska Z., Stępniewski W., Włodarczyk T., Przywara G., Bennicelli R., 2001. Effect of oxygen deficiency on soil dehydrogenase activity (pot experiment with barley). *International Agrophysics* **15**(1): 3–7.

Callesen I., Raulund-Rasmussen K., Westman C.J., Tau-Strand L., 2007. Nitrogen pools and C/N ratios in well drained Nordic forest soils related to climate and soil texture. *Boreal Environment Research* **12**: 681–692.

Classification of Polish Forest Soils, 2000. CILP, Warszawa.

Januszek K., 1999. The enzymatic activity of selected forest soils of southern Polish in the light of field studies and laboratory (in Polish with English summary). Scientific books, AR Krakow, Books 250.

Januszek K., Lasota J., Fiślak A., 2006. The Evaluation of quality of soils of the Carpathian lime tree forest and beech forests on the basis of some chemical and biochemical properties. Acta Scientarium Polonorum, *Silvarum Colendarum Ratio et Industria Lignaria* **5**(2): 71–87.

Kucharski J., 1997. Relationships between the enzymes activity and soil fertility. [In:] Microbes in the environment, occurrence, activity and importance (Barabasz W., Eds). AR Krakow: 327–347.

Lasota J., 2005. Biochemical indicator of mountain forest soil fertility. *Soil Science Annual* **56**: 42–52.

Matuszkiewicz J.M., 2001. Plant community of Poland. PWN. Warszawa.

Mąkosa K., 1992. The degradation of forest sites and the need for their melioration. Prace IBL, Ser. B 15: 201–209.

Mąkosa K., Dzierzbicki J., Gromadzki A., Kliczkowska A., Krzyżanowski A., 1994. Principles mapping of forest sites. Wyd. IBL, Warszawa: 121.

Mysków W., Stachyra A., Zięba S., Masiak D., 1996. The biological activity of soil as an indicator of fertility. *Soil Science Annual* **47**: 89–99.

Rusek A., 2006. Dehydrogenase activity in soil contaminated with diesel oil. *Soil Science Annual* **57**: 106–116.

Trevors J.T., 1984. Dehydrogenase activity in soil. A comparison between ith INT and TTC assay. *Soil Biol Biochem.* **16**: 673–674.

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Streszczenie: Celem pracy było oznaczenie aktywności enzymatycznej (dehydrogenaz i ureazy) w zróżnicowanych troficznie glebach rdzawych i brunatnych. Starano się ustalić zależności pomiędzy aktywnością enzymatyczną a właściwościami fizykochemicznymi w poszczególnych podtypach gleb rdzawych i brunatnych. Kolejnym celem było określenie wpływu szaty roślinnej na właściwości powierzchniowych poziomów gleb. Badania przeprowadzono na 94 powierzchniach, zlokalizowanych w rezerwatach przyrody i parkach narodowych obszaru nizinnego Polski. Aktywność dehydrogenaz, jak również ureazy wykazała duże zróżnicowanie w ramach wyróżnianych podtypów gleb rdzawych i brunatnych. Aktywność dehydrogenaz i ureazy w powierzchniowych poziomach próchnicznych świeżych gleb brunatnych i rdzawych wykazała silny związek z roślinnością. Potwierdza to powiązanie aktywności enzymatycznej z rodzajem akumulowanej substancji próchnicznej, stosunkiem węgla do azotu oraz odczynem poziomów próchnicznych.

Słowa kluczowe: aktywność dehydrogenaz i ureazy, leśne gleby brunatne i rdzawe