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Short Communication

The Role of Dead Wood in Shaping the Abundance of Forest Soils

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Introduction

Deadwood in forest ecosystems is an important reservoir of organic carbon and nutrients. It is estimated that wood is 90-99% cellulose, hemicellulose, and lignin, and 50% C, 44% O, and 6% H, with trace amounts of: N (0.08-0.2%), P (0.003-0.03%)) [1,2]. Due to its high C content, deadwood contributes to carbon sequestration and is a source of macro elements, i.e. N, P, K, Ca, Mg, and NH4 in soil [3].

The effects of deadwood on soil organic matter (SOM) stabilization are still not fully understood. According to [4] the estimated soil resources of SOM are about 1550 Pg C, which is three times the content in the atmosphere and terrestrial vegetation. Forests play an important role in storing carbon resources and, if properly managed, can stabilize the climate, even under conditions of anthropogenic increases in CO_2 in the Earth's atmosphere.

Dead wood is an important element of a properly functioning forest ecosystem, as it affects biodiversity, soil fertility and participates in water retention [5,1]. The aim of the study was to evaluate the content of carbon and selected macro elements in forest litter and soil against the background of long-term leaving of deadwood on the soil surface of the forest reserves of the Białowieża Forest in northeastern Poland [6].

Material and Methods

The study was conducted in the Białowieża Forest in northeastern Poland (Podlaskie Voivodeship). The Białowieża Forest was included in the World Natural Heritage List in 1992 UNESCO and is the last original fragment of the forest that once covered the European plain. The research was conducted in the reserves "Lipiny" (LP) (52°45'12'N; 23°38'40'E) and "Dębowy Grąd" (DG) (52°44'12' N; 23°41'30'E), in the area of the stand, which is over 110 years old. The main tree species in the stand were: *Picea abies L, Quercus petraea, Quercus robur, Carpinus betulus.* The studies were conducted on Epidystric Cambisoils (LP) and typical Albic Luvisoils ("DG"). Soil samples were taken up to 40cm depth (0-0, 0-5, 5-10, 10-20, 20-40cm) and forest litter (0-0). The following parameters were measured in forest litter and soil samples: -acidity of substrate (pH) in 0.01 mol/l CaCl2 by potentiometric method according to PN-EN ISO 10390:1997, -TN and TC, by high temperature method with TCD detection according to PN-EN - ISO 10694:2002, - P, K, Ca, Mg by inductively coupled plasma atomic emission spectrometry (ICP-OES).

Results

Long-term deposition of deadwood logs on the soil surface can promote the accumulation of nutrients in forest litter and their slow migration into the forest floor. This is especially true for carbon and nitrogen, and to a lesser extent P, Ca, and Mg. Long-term deposition of deadwood logs on the soil surface can promote the accumulation of nutrients in forest litter and their slow migration to the forest floor; this is especially true for carbon and nitrogen

and, to a lesser extent, P, Ca, and Mg. Slow accumulation in the soil leads to increased carbon sequestration and greater biodiversity in forest ecosystems.

Leaving dead wood in old-growth forests over a long period of time favors the sequestration of C in soils and may increase the fertility and biodiversity of forest habitats in the long term (Table 1).

Table 1: The pH value and of C and macronutrients content in forest litter (0-0) and soil (0-10cm) from forest reserves of the Białowieża Forest 2021.

Object	Variant	Layer (cm)	pH_{CaCl2}	C	N	P	K	Ca	Mg
				g·kg^{-1} DM (dry matter)					
„LP”	0	0-0	4,27	327,38a	9,310a	0,732a	1,560a	5,225a	0,666a
		0-5	3,84	33,37	1,703	0,431	0,551	0,503	0,449
		05-Oct	3,83	20,08	1,013	0,046	0,438	0,281	0,436
	1	0-0	3,81	429,84b	12,670a	0,732a	0,895a	5,897a	0,674a
		0-5	3,59	51,45	2,267	0,392	0,636	0,685	0,473
		05-Oct	3,79	19,40	0,923	0,466	0,451	0,387	0,487
„DG”	0	0-0	4,97	340,55a	15,593a	0,897a	1,088a	11,585a	0,877a
		0-5	4,93	53,41	3,670	0,462	0,532	3,302	0,605
		05-Oct	4,63	23,72	1,733	0,326	0,435	1,450	0,537
	1	0-0	4,25	462,23b	12,500a	0,650a	0,887a	9,972a	0,771a
		0-5	5,01	83,15	6,177	0,564	0,663	6,962	1,002
		05-Oct	5,21	58,15	4,500	0,438	0,604	4,069	0,918

^{a,b} - significant differences between the average content of the component in the soil of the reserve depending on the variant: 0 (control), 1 (with dead wood).

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