Applied Soil Ecology xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

Applied Soil Ecology

journal homepage: www.elsevier.com/locate/apsoil

Review

Humusica 2, article 11: Histic humus systems and forms–Epihisto intergrades and dynamics

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ARTICLE INFO

Article history:
Received 26 January 2017
Received in revised form 28 February 2017
Accepted 2 March 2017
Available online xxx

Keywords:
Histosols
Soil water dynamics
Humus
Biodegradation
Peats
Wetlands

ABSTRACT

The processes of formation and evolution of Histic humipedons are related to the soil/water dynamics. In a first part of the paper we present diagnostic features and horizons necessary for describing the intergrade humipedons existing between Histic and Hydro humipedons. Called Epihistic ("superficial" Histic), these humipedons are very common and help in better defining the relationships between plant and soil in semi-terrestrial environments. In a second part of the paper we set some information about biological activities and correlated environmental frames of Histic and Epihisto units. The article concludes with dynamic relationships between humipedons, describing them in fen or bog ecosystems, allowing the interpretation of complex wetlands. The present manuscript updates the description and classification of semi-terrestrial humus forms previously published by Zanella et al. (2011a, 2011b).

Contents

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http://dx.doi.org/10.1016/j.apsoil.2017.03.001
0929-1393/

1. Specific terms and diagnostic horizons

Intergrades between Histic and Terrestrial humus systems are necessary for understanding the processes of litter transformation and soil formation in wet ecosystems (Fig. 1).

1.1. Hydromorphic properties

The prefix "g" indicates the presence of reductimorphic and/or oximorphic colours. Reductimorphic colours reflect permanently wet conditions (indicating the presence of soluble reduced iron: grey colours, bluish-green greys) while oximorphic colours reflect oxidizing conditions, as in the capillary fringe and in the surface horizons of soils with fluctuating groundwater levels. Oximorphic colours indicate the presence of insoluble oxidised iron: reddish brown, bright yellowish brown, orange, dark orange or pale yellow. Reductimorphic and oximorphic colours cover only some parts of the soil volume when hydromorphic properties are weakly expressed. Bluish-green and black colours are unstable and often oxidize to reddish brown within a few hours of exposure to air. Oximorphic colours at the inside of superficially grey soil aggregates indicate a recent and instable submersion of the aggregates. A hydromorphic horizon may be all grey in case of permanent submersion or more or less finely mottled grey and orange if sequences of phases of submersion/emersion occur.

1.2. Hydromorphic organic horizons

ORGANIC HORIZONS: organic horizons submerged and/or water-saturated for a non-protracted period of the year (less than 6 months per year) and showing the effects of temporary anoxia; carbon content 20% or more (approximately 40% organic matter) by weight, in dry samples without living roots (Method: element analyser; ISO 10694, 1995). Horizons still under saturated circumstances or drained.

gOL, gOF, gOH (from hydromorphic Terrestrial horizons): hydric organic horizons formed under non-prolonged water saturation (less than 6 months), periodically water-saturated and showing the effects of temporary anoxia. A prefix letter "g", written before the code of Terrestrial horizons, indicates the presence of hydromorphic properties: plant remains becoming dark, glued together and often coloured along leaf veins (more evident than usual) by black particles of humic component deposited here by water during immersion periods; humic component often dark grey or black, massive and plastic, may be structured in faunal droppings during aerated periods. Carbon content $\geq$ 20% by weight. Humic component less than 10% in volume (roots excluded) in gOL (Fig. 2), between 10 and 70% in gOF (Fig. 3) and more than 70% in gOH.

1.3. Hydromorphic organic-mineral horizons

ORGANIC-MINERAL HORIZON: submerged and/or water-saturated for a non-protracted period of the year (less than 6 months per year); carbon content generally less than 7% by weight, in dry samples without living roots (Method: element analyser; ISO 10694, 1995).

gA (from terrestrial A horizon and "g" for hydromorphic properties): hydromorphic organic-mineral horizon showing evident effects of temporary anoxia such as oxidation/reduction iron-mottling colours (orange-red splashes within grey to bluish-grey mass) covering at least 1/3 of the surface of the horizon profile; carbon content generally less than 7% by weight. All terrestrial A horizons can show hydromorphic properties (gzoA, gnozA, gmaA, gmeA, gmiA, gmsA, gsgA, gamaA, gameA, gszoA). Sometimes these properties are only traces of past events and are not in accordance with the current hydrological situation. If carbon content is higher than 7% by weight, similarities with mrA or HS are

Fig. 2. gOL horizon. In water litter becomes in a first time (5 months or less) brown and later decidedly black.

Fig. 3. gOF Horizon. As in dry conditions, the percentage of recognizable remains is comprised between 10 and 70% of the volume of the horizon.

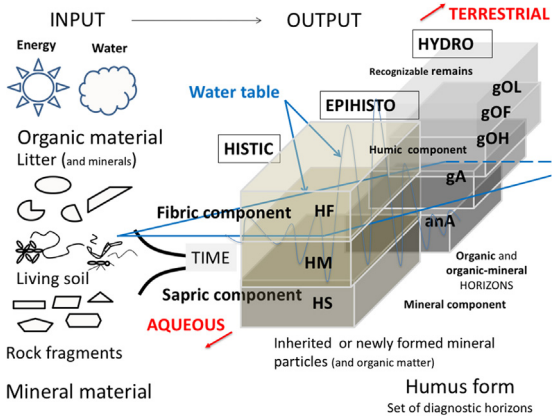

Fig. 1. Epihisto and Hydro intergrades, along a gradient going from Histic to Terrestrial humus systems.