

## Foreword

The current special issue of the *Estonian Journal of Ecology* publishes selected papers of the International Scientific Conference ‘Humus forms and biologically active compounds as indicators of pedodiversity’ held in Tartu on 27–28 August 2012. The conference was dedicated to the 10th year of scientific collaboration between the Institute for Agricultural and Forest Environment (Poznań, Poland) and the Estonian University of Life Sciences (Tartu, Estonia) on researches into soil organic matter.

An agreement on this scientific cooperation between the Estonian Academy of Sciences and the Polish Academy of Sciences was concluded in 2002 with the project title ‘Changes of the soil organic matter as results of agricultural intensity and utilization’. In the course of the consecutive collaboration the subject matter and the title of the cooperation projects have been modified: 2007–2009 ‘Composition of soil organic matter as an indicator of soil and ecosystem functioning activity’, 2010–2012 ‘Organic matter (peats) decomposition kinetics in *Histosols*’, and 2013–2015 ‘Researches of soil organic matter decomposition kinetics and pathways by selected marker compounds’.

The investigations in the framework of joint projects have been focused (1) on the content and differences of biologically active substances in mineral and organic soils under various conditions of management and fertilization and (2) on processes and mechanisms of organic matter conversion in soils. In connection with the projects new analytical methods for the determination of biologically active substances in soils and plants have been developed.

It is generally well known that the content of organic matter, its distribution in the soil profile, composition, and functioning are soil type and site specific. The pedodiversity of natural areas, which is mainly the heritage of their geological and hydrological diversities, is always more or less influenced by soil organic matter and by soil organisms’ activity in its transformation. The interrelationships of ecosystems’ *bio* and *geo* components are reflected regularly in the topsoil (epipedon) fabric, which is determined by humus cover type (or humus forms).

The humus cover is always more or less influenced by the flux of falling plant debris on or into the soil. The transformation of ‘fresh organic matter’ into humus depends on soil type and plant cover composition. The variegated fabric of humus cover reflects the variety of ecological influences and substances composition. Therefore humus forms may be regarded as useful indicators for characterizing the interrelationship of environmental factors and for the evaluation of the functioning efficiency of an ecosystem. Good tools for understanding the processes and mechanisms of the formation of the humus profile are the biologically active compounds, which reflect also the functioning character of soil organisms.

The conference focused primarily on the formation and fabric of soil humus forms, on their ecology, biochemical composition, and classification. The pre-

sentations encompassed a wide range of land uses (arable, grasslands, and forest), soil types (from mineral to organic soils), soil properties (texture, moisture conditions, acidity, calcareousness), and biochemical processes and substances studied under pedo-climatic conditions of Northern and Central Europe.

The programme of the conference corresponded well to our preliminary aims. The two conference keynote speeches were ‘Humus forms and topsoil classification. Where do we stand?’, given by Prof. Gabriele Broll from the University of Osnabrueck (Germany), and ‘The effectiveness of simultaneous chemical and physical analyses as a tool for the understanding of processes and mechanisms in soils’, given by Prof. Lech W. Szajdak from the Institute for Agricultural and Forest Environment (Poznań, Poland). An overview about all conference themes is available in the abstract book *Programme–Abstracts–Participants of International Conference ‘Humus forms and biologically active compounds as indicators of pedodiversity’* (Tartu 2012), compiled by K. Kauer and R. Kõlli.

Regardless of certain loss in themes as compared with the conference programme, this special issue and the three papers to be published in the next issue of this journal reflect relatively well the problems discussed at the conference. The following main findings are reported in the selected papers:

- Regional peculiarities exist in the formation and fabric of humus cover caused by differences between soils and climatic conditions. Humus cover type is a good complex indicator for the characterization of the functioning of the whole ecosystem as well as its compartments (among them soil cover).
- A shelterbelt, as an efficiently functioning biogeochemical barrier, decreases the quantity of chemical compounds migrating from cultivated fields in groundwater.
- Humic acids isolated from an ombrotrophic bog peat profile were used to study relationships among peat age, decomposition, and humification degree, botanical composition, and properties of peat humic acids. It is stressed that a major factor influencing the diagenesis of peat organic matter properties is the character of the humification process, as the composition of peat humic acids is little affected by differences in the composition of precursor living organic material.
- The alterations of organic carbon content in soil humic and granulodensimetric fractions in dependence on soil use systems are explained. Tillage had a greater influence than crop rotation on all soil carbon fractions. The introduction of overwintering crops into the rotation had a positive influence on the carbon content in particulate organic matter and in light fractions within the whole plough layer.
- The dependence of urease and saccharase activities on oilseed rape root biomass is explained.
- Peroxidases are involved in ecologically important polymerization processes, resulting in increasing environmental persistence of organic substances. Forest islands formed on mineral and mineral–organic soils influence the concentrations of iron forms and peroxidase activity in groundwater.

- The effects of various organic mulches and different thicknesses of the mulch layer on soil organic carbon are evaluated.
- The decomposition intensity of alpha-cellulose on soil surface of different types of natural meadows (coastal, boreo-nemoral, flooded, and wooded) was studied. The differences in the mass loss between different meadows are caused mainly by dissimilarities in the living conditions of microbial communities

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Chairman of the conference scientific committee,  
guest editor of the special issue