

Soil organic matter is a key indicator of soil quality, which determines its physical properties, chemical and biological. The behavior of the humus soil is important not only because of the maintenance of productive functions of soil, but also the role that it plays in carbon sequestration. Frequent references in scientific literature to words connected with quality standards of humus and the soil quality itself do not, however, describe individual coefficients such as quantitative and qualitative parameters of humic compounds. Moreover, full comprehension of the role of organic matter in soil functionality requires development of research aiming at discovering not only the role and kinetics of changes of particular fractions of humic compounds in soil, but also their nature.

Due to the indisputable significance of humus in many biochemical processes as well as its increasing deficit particularly in light soils, alternative sources of substrates for the production of this constituent should be sought. Considering the physical, chemical and biological stability, the solid product of thermal transformation of biomass called biochar may be such a source. Biochar is a material chemically stable, exhibiting low susceptibility to degradation and microbial decomposition. Application of such a material, particularly to soils classified to the agronomic category of light soils, will unquestionably contribute to stabilizing the organic matter content, and in consequence may constitute a perfect substrate for a long-lasting process which is the generation of humus. For this reason it might find wide use in environmental protection in the context of a safe and long-term storage of carbon in the soil and thus contribute to the improvement of the deficit of soil organic matter. In addition, specific properties of biochar, such as a developed surface area, microporosity, and the presence of surface functional groups (eg. a carboxyl, hydroxyl and phenol group) might contribute to the initiation multidirectional changes in soil resulting in improvement in soil fertility and productivity.

Cognitive aspect as well as the need to integrate, organize and fill the gap in knowledge on this subject prompted to undertake a study aimed at developing a model based on biochar changes in soil based on quantitative and qualitative parameters of humus and respiration activity, enzymatic activity and ecotoxicological properties of the soil. **The main assumptions of the study** is to analyze qualitative and quantitative composition parameters of humus in the raw materials (biomass, biochar, soil), determine the impact of the application of biochar on soil quality and quantity of functional groups in soil and to determine the dynamics of changes in the content of carbon compounds extracted in soil conditioned by addition of biochar and biomass which has not been thermally transformed. The study is also planned to determine the effect on the respiration activity of soil, biochemical and ecotoxicological activities of soil with using biochar as a carrier substances toxic to microorganisms living (*Vibrio fischeri* and *Heterocypris incongurens*) on compounds arising in times of biochar in the soil. The combination set forth above research tasks of a chemical, biochemical and ecotoxicological allow comprehensive and reliable verification posed in the scientific objective of this work.

In recent years there has been growing interest in biochar properties and possibilities of using this material in agriculture and environmental protection. Despite numerous efforts in this respect, the problem of the influence of biochar on the quantitative and qualitative composition of humic compounds as well as on the respiration and biological activity of soil is an unrecognized problem not only in Poland, but also in the world. It is explicitly exhibited by a very limited number of literature titles.

Conducting research, especially taking into account the qualitative composition of functional groups of humus, respiration and biological activities of the soil gives a very high potential scientific progress, not only in the of agricultural sciences, but also in areas such as science chemical, biological or finally earth sciences. Moreover, the development of forming a model of biochar changes taking into account the aforementioned aspects may play a key role in terms of detoxification and restore lost properties of soils. Is therefore issue is a key problem that must be tackled wanting to maintain a good level of fertility of soils especially in the categories agronomic light soils.