

Summary

The use of biocarbon and ash from plant biomass as a fertilizing material has a positive effect on the physical, chemical and biological properties of the soil and thus contributes to an increase in the yield of plants.

The study attempts to evaluate the possibility of using biocarbon and ash for fertilization of two selected species of perennial energy plants, i.e. basket willow (*Salix viminalis* L.) and giant miscanthus (*Miscanthus x giganteus*). The research concerned the optimization of the combination of fertilizer doses of the above materials in the context of the obtained crop. The analyses were also focused on the use of the obtained plant biomass for the production of pyrolysates for fertilizing purposes.

Two separate two-factor experiments were carried out in the years 2015 - 2017. The collected soil samples, plant biomass and produced pyrolysates were analyzed and compared in the context of pH value, content of available forms of phosphorus (P_2O_5), potassium (K_2O) and magnesium (Mg), total carbon content, hydrogen and total nitrogen, total content of selected macro- and micronutrients and heavy metals, energy value of biomass and dry matter yield of aboveground parts of plants. The use of advanced statistical models allowed determining the occurring interactions.

Interpretation of the obtained results enabled the selection of optimum fertilizer doses influencing a significant increase in the yield of plants and improvement of chemical properties of soil. The use of the aboveground parts of basket willow plants and giant miscanthus in the pyrolysis process with the use of appropriate parameters of the process allowed for obtaining biocarbon with a high content of nutrients. It was found that the use of biocarbon, ash from biomass and their combination in appropriate doses as a soil additive can be a form of substitute for classic mineral fertilizers and can strengthen the ecological aspects of energy crops cultivation.