

Impact of chicken manure fertilization on chemical and biochemical properties of soils

Wpływ nawożenia pomiotem kurzym na właściwości chemiczne i biochemiczne gleb

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Many agricultural farms, located in the vicinity of poultry farms, fertilises soils with chicken manure, being the source of macro- and microelements. The paper compares the chemical properties and the enzymatic activity of soil fertilised with chicken manure and with the soil non-fertilised with it. Mineral fertilisation of the soils in both cases was low and it did not exceed 60 kg NPK per hectare (no liming). In the soil sampled from the arable horizon, next to the basic physical and chemical properties, the content of phosphorus, potassium and magnesium available to plants was determined. The activity of selected enzymes was also assayed: catalase (KAT), dehydrogenases (DEH), alkaline (AIP) and acid phosphatases (AcP). With the results of their activity, there were calculated the enzymatic index of soil pH (AIP/AcP) and the biological index of fertility (BIF). After the mineralization of samples in the mixture of HF and HClO₄ acids, the total content of Zn, Cu and Mn was determined, whereas after the extraction with the DTPA solution, the phytoavailable forms of those metals were assayed. To verify the results, the analysis of variance was used.

The aim of this research has been to evaluate the soil environment after the application of 10 tonnes of chicken manure, annually for 10 years. Determining the biochemical properties facilitated a more comprehensive evaluation of changes which occur in soil as a result of many-year fertilisation with that natural fertiliser. The application of chicken manure resulted in a significant increase in the content of organic carbon and nitrogen as well as base saturation in soil. Such fertilisation significantly increased the content of phosphorus, potassium and magnesium available to plants. Chicken manure slightly affected the total content of the trace elements under study. There was found, however, a two-fold increase in the content of Zn available to plants, as compared with the content of that metal in soil non-fertilised with chicken manure. There were recorded higher values of biological index of fertility (BIF) of soil provided with that natural fertiliser. The activity of phosphomonoesterases was significantly lower in soil after its application. An increased level of inorganic phosphorus must have acted as a competition inhibitor, decreasing the activity of phosphatases. The value of the enzymatic index of pH for soil non-fertilised with chicken manure ranged from 0.43 to 0.50, which confirms its acid reaction.

The results of research show that chicken manure is a good source of nutrients to plants. By applying high rates of chicken manure, it is necessary to evaluate its content of nitrogen compliant with the Nitrates Directive which provides for the limit of nitrogen per hectare per year from manure being 170 kg. The use of relatively high rates of chicken manure considerably increases the richness of soil in the forms of phosphorus, potassium and magnesium available to plants, which allows for limiting mineral fertilisation.