DOCTORAL THESIS ABSTRACT

The efficiency of sanitization of pig slurry and biogas production depending on the type of used substrates in agricultural biogas plants.

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Large-scale pig farming is associated with the production of large amounts of animal excrements, which after processing in the form of, e.g. slurry, are managed on agricultural land as natural fertilizers. The utilization of pig manure on agricultural land in excess and in an uncontrolled manner may pose a threat of the spread of zoonoses due to the content of significant amounts of potentially pathogenic microorganisms. One way to neutralize liquid manure is to use it as a substrate in the biogas production process.

The aim of this study is to determine the impact of the methane fermentation process carried out in two agricultural biogas plants differing in the type of substrates used, on the efficiency of sanitization of the input biomass, including pig slurry and biogas production.

Samples of pig slurry, input biomass and digestate from two agricultural biogas plants: Giżyno biogas plant, which uses as a substrate pig slurry from breeding farm and Świelino biogas plant, which uses as a substrate pig slurry from fattening farm were included in the current study.

Physicochemical analyzes have shown that slurry, input biomass and digestate from the biogas plant in Świelino were characterized by a significantly higher content of organic dry matter, ash and ammonium nitrogen than slurry, input biomass and digestate from the biogas plant in Giżyno. The parameters of the methane fermentation process, including temperature and pH, reached higher values in the biogas plant located near fattening farm (Świelino) as compared to the biogas plant located near breeding farm (Giżyno).

Microbiological analyzes showed significant differences in the number of analyzed groups of microorganisms between slurry, input biomass and digestate in both biogas plants. The slurry and input biomass from the biogas plant in Świelino (fattening farm) contained higher number of microorganisms than the slurry and input biomass from the biogas plant in Giżyno (breeding farm). Regardless the higher number of microorganisms found in the input biomass, the biogas plant in Świelino was characterized by a higher degree of reduction of the analyzed groups of bacteria. Furthermore, regardless the number of microorganisms in samples of input biomass, their numbers reached similar values in the post-fermentation residues.

The daily biogas production efficiency as well as the daily biogas yield from 1 m^3 of fermenters' working capacity in biogas plant located near fattening farm were significantly

higher than in biogas plant located near breeding farm. The daily methane yield from 1 m^3 of fermenters' working capacity was also significantly higher in Świelino biogas plant. On the other hand the daily methane production efficiency in both biogas plants was at a similar level. The biogas production process was more efficient in Świelino biogas plant, which used as a substrate pig slurry from fattening farm with a higher dry matter, organic dry matter, and nitrogen content in comparison to Giżyno biogas plant. At the same time, the efficiency of sanitization of the input biomass, including pig slurry was significantly higher in biogas plant located near the fattening farm in comparison to the biogas plant located near the breeding farm. Due to the above, it is recommended to locate a biogas plants near pig fattening farms.

2020-10-28 Gmiński Michał