

Assessment of the possibility of using ash from municipal sewage sludge for fertilization of selected plant species for energy purposes

SUMMARY

With the problem of sewage sludge processing, many economies are struggling. The ban on storing unprocessed sludge in Poland, prompts the search for new solutions. The most popular processes for processing municipal sewage sludge are thermal processes. The ashes formed after the thermal processing of municipal sewage sludge account for approximately 45% of the dry matter content of the sludge subjected to this process. It is therefore imperative that we seek the best available and safe opportunities for the practical application of ashes.

Ashes can be further used, due to their chemical composition, as well as the richness of macro- and micronutrients. It has been assumed that the ashes formed after the thermal treatment of sewage sludge can replace mineral fertilizer with the cultivation of certain plants for energy purposes.

To prove the thesis, laboratory experiments were conducted and two years of experimental cultivation on the fields of Rzeszow University in Załęże. Giant miscanthus and ordinary corn were cultivated for energy purposes. Ash fertilization from thermal disposal of sewage sludge and nitrogen was applied. The ashes used in the experiment contained significantly more potassium than phosphorus, with a low calcium content and practically zero nitrogen. Cultivation was carried out on 54 experimental plots. The area of one plot was 30m².

The chemical composition of the soil on which experimental plots were planted was determined, taking into account the content of macro and micronutrients in the soil. The content of assimilable forms was determined by the Egner-Riehm method. Determination of the total content of elements in the soil and cultivated plants was carried out using an apparatus analyzing the chemical composition of ICP - OES 6500 after prior mineralization of the test material in a mixture of nitric (V) and vinyl chloride (VII).

The influence of ash fertilization resulting from thermal treatment of waste, on yielding and biometric characteristics and physiological parameters of cultivated plants was assessed. a comparative analysis of the biometric features and chemical composition of aboveground plants of the same species. The influence of the investigated factors on the calorific value of plants was analyzed. The biomass of maize and corn biomass and maize

grain was determined by testing with a LECO AC500 calorimeter based on the standard (PN-EN14918:2010).

Statistical analysis of the results was performed using 2 factorial analysis of variance in the split-block layout. Years of experience 2015-2016 number of replication $n = 3$. Calculations were made with Tukey's level of significance $\alpha = 0.05$. Calculations were made using the Analwar 5.3 FR program, the author of the program is prof. Franciszek Rudnicki. The NIR0.05 values are shown in the mean results tables by specifying the following effects of ash fertilization on thermal municipal sewage sludge utilization, NB - nitrogen fertilization, and interactions between the above. NB / NA factors.

As a result of field studies, was selected optimal dosage of nitrogen fertilization and ash for giant miscanthus (*Miscanthus x giganteus*) and common maize (*Zea mays*).