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TRANSFORMATION OF HIGH DENSITY GREEN ENERGY WITH SIMULTANEOUS DECONTAMINATION OF THE ENVIRONMENT

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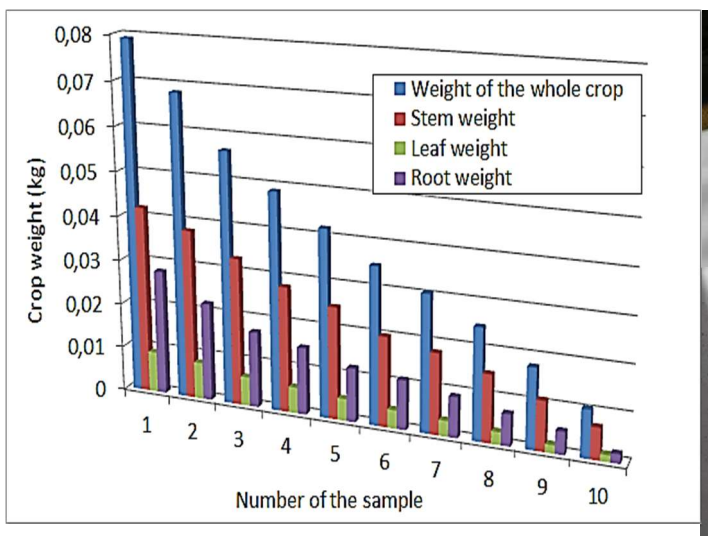
Introduction

New energy sources are being sought due to the ever-tightening of emission limit quotas. The primary attention is paid especially to the so-called green energy sources, which are obtained on the basis of renewable energy. The main reason is that these energy sources make it possible to produce environmentally friendly energy. At the same time, by changing the legislation in Slovakia towards improving the quality of the environment by supporting the use of renewable energy sources, we are increasingly encountering the search for reserves of the potential of renewable energy sources. We see this reserve especially in the area of green biomass. Of course, the advantage is that these new renewable energy sources have the least possible negative impact on environmental degradation. The ideal case is if their use not only does not harm the environment, but on the contrary can eliminate the amount of emissions in the air or harmful substances in the soil. In terms of geographical location and the current level of agriculture, Slovakia has a number of advantages in the field of obtaining energy from renewable energy sources. It has free energy potential mainly in the field of biomass production. At the same time, it is mainly the cultivation of the so called energy crops. In addition to ecologically clean energy production, its ecological transformation into mechanical, thermal or electrical energy is also important. One of the alternative ways of ecological use of energy crops grown in Slovakia is their energy recovery through compaction in the form of briquettes or in the form of anaerobic fermentation with subsequent production of biogas.

Currently, the total available technical potential of biomass in Slovakia is estimated at more than 160 PJ (25.10^6 t). Of this potential, approximately 56.8 PJ falls on purpose-grown biomass in the form of energy crops.
Various crops species characterized by high yields are bred, the calorific value of which ranges from 8.1 to 18.6 $MJ.kg^{-1}$ depending on the water content.

Results

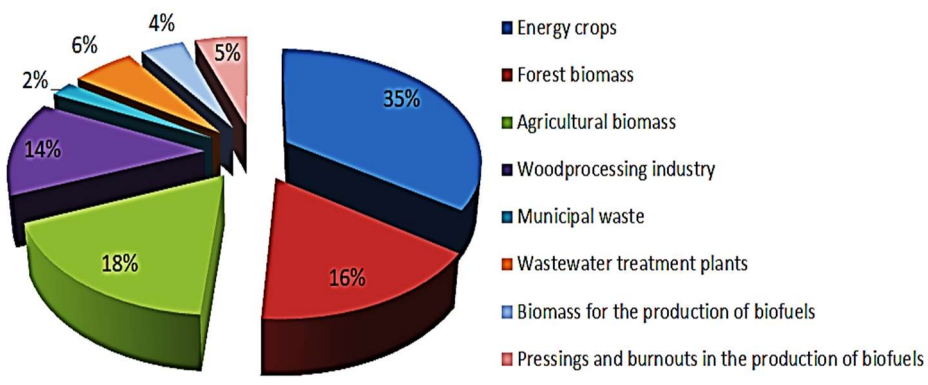
The root and the aboveground part are considered to be energetically valuable parts of the Amaranthus caudatus plant. The advantage of this plant is also the ability to extract a lot of heavy metals from the soil, while its energy treatment can permanently remove these harmful substances from the contaminated soil. Based on experimental research and subsequent analysis, it can be stated that the calorific value of briquettes from the dried plant Amaranthus caudatus is 14.0 $MJ.kg^{-1}$. The calorific value of biogas obtained by the process of wet anaerobic fermentation of green parts of Amaranthus caudatus plants is $6kWh.m^{-3}$. Although the amount and calorific value of biogas obtained by the wet anaerobic fermentation process of green plants of Amaranthus caudatus is slightly lower compared to the amount and calorific value of briquettes obtained from dried plants, this process is less energy intensive.



Weights of individual parts of energy crops

Laboratory pressing preparation for the crushed powder of the energy crop Amaranthus caudatus

Technically usable potential of biomass in Slovakia



Conclusion

The aim of the paper was to provide an extended view of two basic possibilities of energy transformation of the plant Amaranthus caudatus, which can be easily grown in Slovakia. The possibility of producing briquettes and biogas was described, while the two products of the energy plant Amaranthus caudatus were compared not only from an energy point of view, but also from an environmental point of view. Based on the performed analysis, it can be stated that each of these methods of energy recovery of green parts of the plant has its benefits and disadvantages.

Research 1. When examining the content of heavy metals, which the energy crops absorbed from the soil, it was found that for all monitored indicators, the highest values were recorded in the underground part.
2. From the point of view of the practical application of the energy crops Amaranthus caudatus for energy purposes, it is necessary to compact it in the form of pellets or briquettes.
3. Another possibility of energy recovery of the Amaranthus caudatus plant is its anaerobic fermentation in order to obtain biogas.

Acknowledgements

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