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Nowadays, biogas plants have been proliferated and there is an imperative need for additional feedstock in order to meet the surplus needs. Lignocellulosic residues are increasingly used as a substrate in full scale biogas plants and consequently grass from marginal lands can be an excellent source for extra biomass to be used for bioenergy production. More specifically, meadow grass is abundant in global agricultural area and therefore this substrate could be utilised for biogas production. However, the utilisation of biomass from these low input cultivated areas is economically feasible only from the highest yielding plots and the plots with close proximity to biogas plants. Moreover, an efficient pretreatment method is needed in order to increase the access of microorganisms to the degradable ingredients.
The present study aimed to examine different mechanical pre-treatment methods for meadow grass and to define whether the pre-treated meadow grass pose the desired characteristics (e.g. size, disruption of the heterogeneous structure of lignocellulose) for efficient biogas production. Moreover, in the present work we investigated potential correlation between the results derived from the standard protocol of biochemical methane potential in comparison with other alternative physicochemical methods (i.e. conductivity test, soluble chemical oxygen demand (SCOD)) in order to define the most accurate and less time-consuming process to evaluate the substrate's degradability efficiency.

Thus, in order to investigate the impact of different mechanical pre-treatments on the biodegradability of ensiled meadow grass, methane potential batch assays were performed. The methane potential was determined according to the guidelines of the biochemical methane potential (BMP)

protocol. All tests were performed in triplicate and the operating temperature was 54 ± 1 °C. Moreover, scanning electron microscopy (SEM) allowed the evaluation of the plant tissues deconstruction after each pre-treatment configuration.

The results obtained from the present study revealed that all the pre-treatment configurations enhanced the digestibility of the meadow grass. However, there was a statistical significant difference of the level of the degradation efficiency among the different configurations. The most efficient pre-treatment method resulted in more than 30% increase of the methane yield compared with the untreated ensiled meadow grass. The increased efficiency was also verified from the SEM observations, as distinct structural variations were observed. Finally, multiple linear regression models predicted the BMP with r2 equal to 56.9 and 42.2 by the results obtained from the conductivity and SCOD test, respectively.

between fuel and food production. Further attempts in optimizing the process should be made.