

## Methanation of residues deriving from the bioactives extraction process of dandelion leaves (*Taraxacum officinale*)

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### BACKGROUND

*Taraxacum officinale* is a plant known for the medicinal qualities associated to their different bioactive principles, giving it great potential as a feedstock for the recovery of bioactive compounds. However, the extraction processes of these bioactive principles can generate a waste stream rich in solvents, which by its nature can be a major industrial source of pollution. The aim of this work was to determine the potential of these wastes to be degraded throughout a methanation process in order to obtain a biogas stream.

### MATERIALS AND METHODS

This test was based on the procedure described by Field *et al.* (1987) for wastewater. The assay was carried out at 36 (±) 1°C in 100 mL vials considering an organic matter concentration in the exhausted residue (the residue after the extraction process) of 1% (measured as volatile solids) equivalent to ± 4.5 - 5.0 g leaves/vial and using a methanogenic biomass inoculum concentration of 1.5 g VSS L<sup>-1</sup> (methanogenic activity value of 0.7 g COD-CH<sub>4</sub> gVSS<sup>-1</sup>d<sup>-1</sup>). The effects of the bioactives extraction process on the methanation were analyzed after 24 hours, by both comparing the methane production rate (*VCH<sub>4</sub>*) and determining the methane reduction potential (*MRP*) (the latter also at 4 days). The test was performed using methanol (*M*), ethanol (*E*), water (*W*) and its hydroalcoholic mixtures as solvents. The control assay (*C*) corresponds to the methane potential of non extracted leaves, while in the blank assay (*B*) the sample was replaced by a solution of volatile fatty acids with an equivalent COD content.

The *MRP* was calculated using the Equation 1, where the volume corresponds to the total accumulated volume of methane (adapted from Jayanegara *et al.*, 2009). This parameter was also calculated at day 4 in order to evaluate the adapting possibility of anaerobic biomass to the substrate during this period.

$$MRP = \frac{VCH_4(\text{control}) - VCH_4(\text{sample})}{VCH_4(\text{control})} \times 100 \quad \text{Eq. 1}$$

### RESULTS

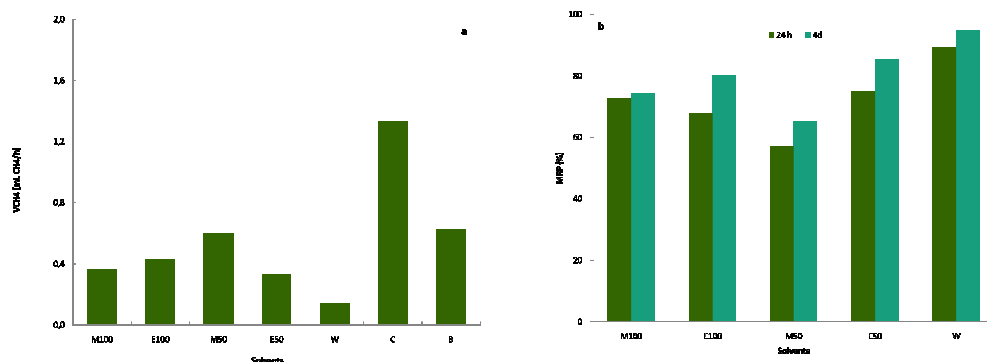


Figure 1: (a) Methane production rate (*VCH<sub>4</sub>*) and (b) Methane reduction potential (*MRP*) at 24 [h] y 4 [d], for different extraction treatments: ethanol (E100%), methanol (M100%), water (W) and hydro alcoholic mixtures of methanol (M50%) and ethanol (E50%).

Results indicated that previous processes of extraction from the dandelion leaves affected methane production, reducing it up to 90%. When comparing the methane production rate (*VCH<sub>4</sub>*) of the control sample (*C*) and the blank (*B*) (Figure 1.a), we can see that this rate for sample *C* (fresh leaves) was almost 100% higher than *B* (1,3 v/s 0,625 [mL CH<sub>4</sub>/h]), indicating that total phenolic compounds content (data not shown) had no detrimental effect on methanogenic activity, although it has been reported that tannins can reduce methane production. Figure 1.b shows that in all cases, the *MRP* increased at day 4, indicating that low production of methane with regards to control was probably not due to a variation on the initial adaptation of the microorganisms but in some particular substrate features. Regarding the possibility of inhibition by the presence of ethanol or methanol in the sample, when *MRP* results are compared, samples treated with water present the lower methane production, thus, the presence of organic solvents from the extraction process proposed, would not be the reason for the decrease in the methanogenic activity.

### CONCLUSION

Anaerobic digestion of exhausted residues of leaves from *Taraxacum officinale* would not be affected by the presence neither of remnant organic solvents in the residue nor by phenolic compound presents in the plant. However, it is possible that solubilization of carbohydrates during the extraction processes could be the determining factor in the important decrease of methane production.

### ACKNOWLEDGMENTS

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