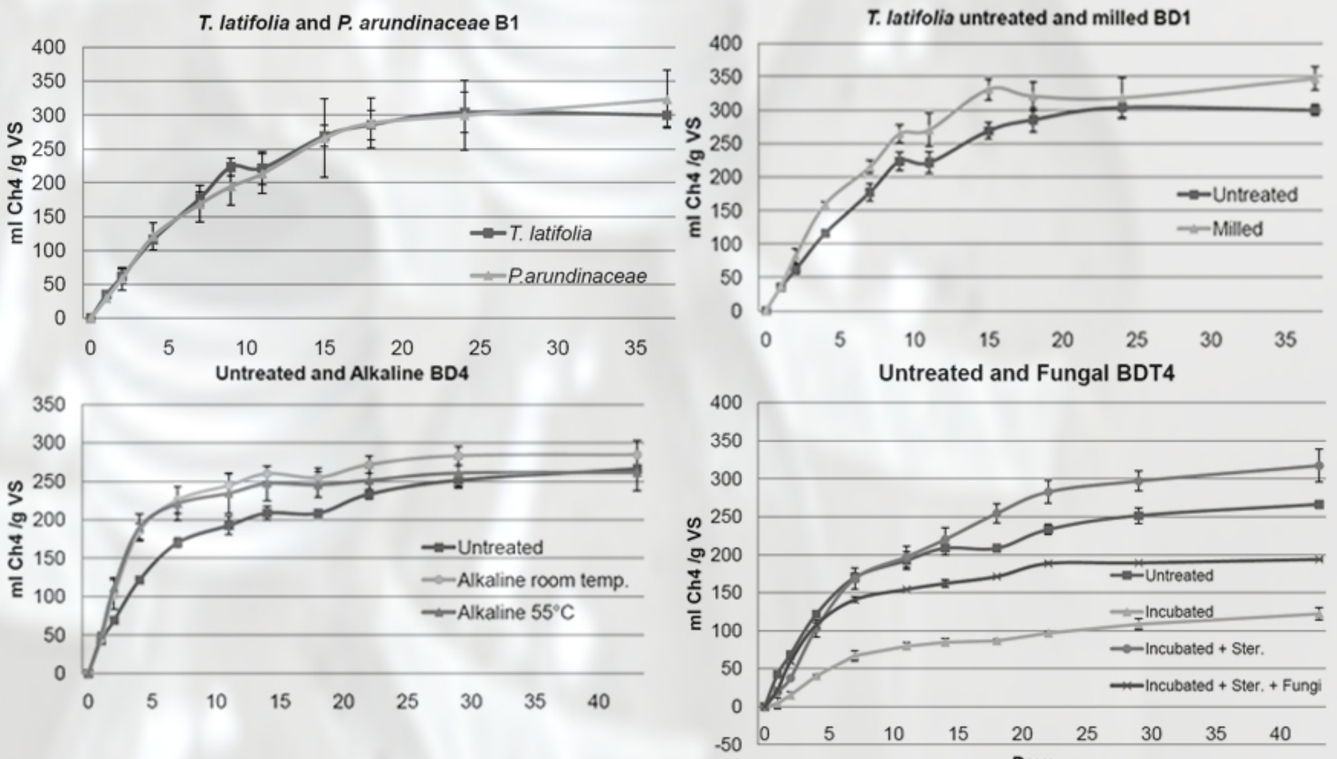
Evaluation of wetland plants as a source for biogas production after mechanical, alkaline and fungal pretreatments.

The biogas production from two species of wetland plants was determined by batch wise digestion in 300-mL bottles. In Addition, three different pretreatments were evaluated for enhanced biogas production: Milling, alkaline and fungal pretreatment. The methane potentials can be used in comparisons between substrates and pretreatments. The potentials are also important when economically evaluating the use of wetland biomass for biogas production.

Background.

Biogas is a promising biofuel that can be produced from a wide range of organic material. However, more substrates are needed if biogas is to become a major alternative to fossile fuels. We raised the question if wetlands can be harvested to provide the biogas industry with more substrate and simultaneously maintain their role as nutrient sinks, preventing eutrophication. However, wetland plants contain some lignin and are relatively hard to degrade. Therefore three pretreatments were evaluated to break the protective structure of the plants that inhibit anaerobic digestion. There are hardly any methane potentials for wetland plants and the combination with these pretreatments has never been done before.



Method

Two species of wetland plants, *Typha latifolia* (common cattail) and *Phalars arundinacea* (reed canary grass), were collected at a small wetland. The plants were dried and cut to small pieces. Pretreatments were carried out prior to batch digestion.

Milling: Plants grinded to fine powder. **Alkaline:** Plants mixed with lime to highly alkaline solution for 24 h. **Fungal:** Oyster mushroom growing on the plant material for 42 days, degrading structural carbohydrates and lignin. The plant material was put in bottles together with water, inoculum and nutrients under anaerobic conditions. Bottles were placed in a 37 °C climate room and methane production was monitored over 6 weeks.

Results

The total methane yield for both wetland species where **295 mL** of methane per g VS by avarage and there where no clear difference between the two species. Milling pretreatment increased the biogas yield with **16,4 %** by average. Alkaline pretreatment increased the biogas yield with **27.0 %** at room temp. and **21.8 %** at 55 °C. The fungal pretreatment decreased the biogas production by **19.9 %**

Conclusion and future prospects

The production of 295 ml methane is a decent yield, similar to other grasses and plants previously tested for methane potential. Pastur crops have a similar yeild and are already used in large scale reactors. This type of substrates can be used in co-digestion with other substrates such as manure in farm scale reactors. However, mechanical problems can arise in the reactors dealing with grasses and plants. Therefore some kind of milling is necessary. This thesis confirms that milling also raises the production. Alkaline pretreatment raises the production but the chemicals are costly. Fungal pretreatment did not work for this kind of species. It is possible that is suitably to apply to hardwood species that are more resistant by nature. Now economical assessment must be made considering both the harvest of the plants as well as the cost for the pretreatments. This can in turn tell if it is worth producing biogas from wetland plants and which pretreatments to use.

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