INNOVATIVE VALUE CHAINS VIA ANAEROBIC DIGESTION OF WOOD FIBRES

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Background information

Poplar wood from short rotation plantation is a commonly used renewable raw material for heat production in combustion plants. In this study the suitability of poplar fibres as an alternative feedstock material for biomethane production via anaerobic digestion is investigated. The innovative concept approach consist of the production of decentralised renewable heat and electricity from poplar wood and the application of the wood fibre fraction in the biogas digestate as a sustainable peat substitute.

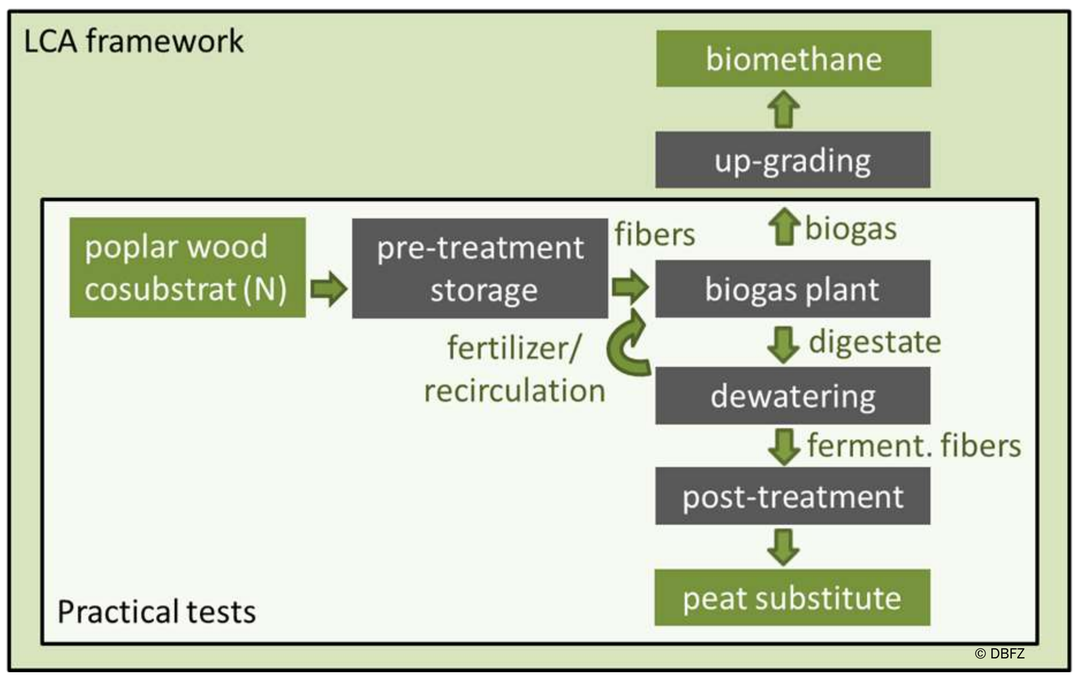

Fig. 1: Schematic draft of the process concept

Material and Methods

Double-function disintegration treatment tests were conducted in order to determine the optimal fibre length for the production of both biogas and peat substitute. Based on preliminary tests, three different gap sizes of the extruder were chosen: 15, 20 and 25 mm. The dry matter (DM) content of the fibres after extrusion was 49.3, 46.4 and 43.5 % w/w of fresh matter (FM). The determination of volatile solids (VS) showed similar results of 97.8 or 97.7 % w/w of DM. DM and VS were measured in accordance with DIN EN 15934 (2012) and DIN EN 15935 (2012).

Fig. 2: Poplar wood chips and fibres obtained after extrusion and BMP testing device AMPTS II

Biomethane potential of poplar wood fibres

The poplar fibres were investigated in biochemical methane potential tests in laboratory scale in accordance with VDI guideline 4630 (2016) in triplicates each. BMP tests were carried out with the AMPTS II device from Bioprocess Control at 39° C. The methane potential was calculated as standardized dry gas (273.15 K and 1013.25 hPa). The methane potentials rose with increased particle size and water content. The best case (gap size of 25 mm) reached methane potentials of 310 mL/g VS and 132 mL/g FM.

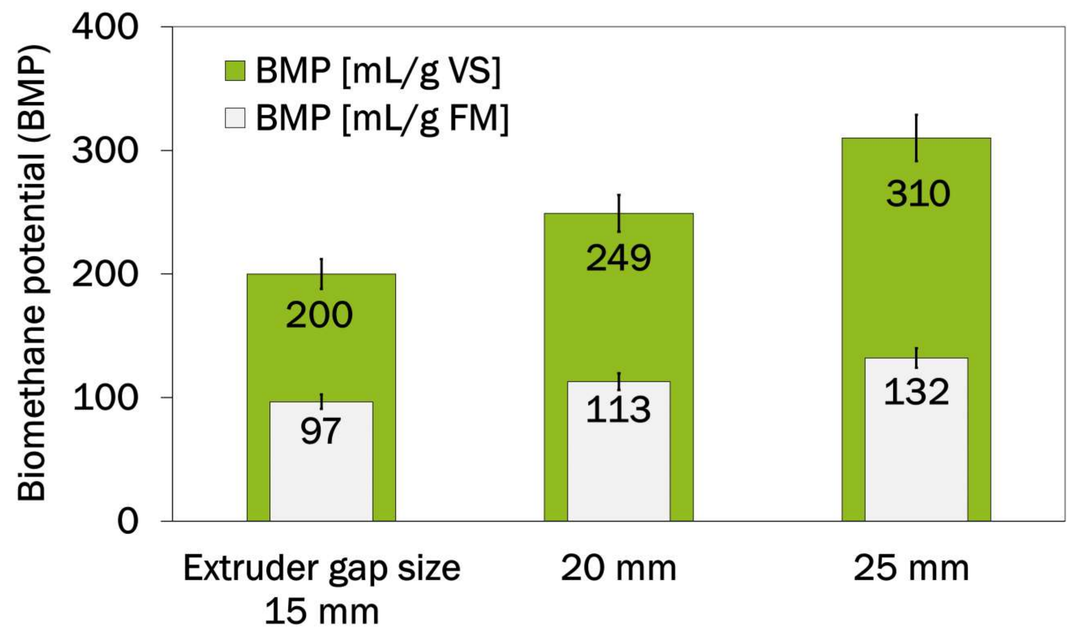

Fig. 3: Biomethane potential of poplar fibres obtained after wood chip extrusion with different gap sizes

Summary and Outlook

The methane potential of poplar fibres obtained after extrusion of wood chips was in the presented experiment in a similar range as the literature value for maize silage (340 mL/g VS or 106 mL/g FM). This indicates the high potential of fresh poplar wood fibres as feedstock for biogas production as a sustainable alternative to annual crops. Further tests investigating the influence of the inoculation material and anaerobic digestion technology on the biomethane potential of poplar wood fibres are part of the ongoing research project PaplGas.

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