Methane production from reed canary grass

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1. Introduction

Methane production of a specific energy crop is affected by the chemical composition which changes as the plant matures. Timing and frequency of harvest are thus important in optimising the feedstock quality as well as the total annual biomass and net energy yield per hectare.

Reed canary grass (*Phalaris arundinacea*) is a tall (150-300 cm) perennial grass, which grows well on many kind of soils (Fig.). Reed canary grass is one of the most efficient producers of herbaceous biomass in boreal conditions. For methane production it should be harvested as fresh biomass, enabling harvesting usually at least twice a year in boreal growing conditions.

The objective of this study was to determine the effect of crop maturity stage on methane yield of reed canary grass.

2. Materials and methods

Reed canary grass was cultivated in Central Finland, Saarijärvi during 2005-2006 on two plots established in 2004. Crops were harvested twice a year (1st and 2nd harvest) in 2005 and once in 2006. 1st harvests were at generative stage or flowering stage and second harvests at vegetative stages (Table). Total solids (TS) of crops varied from 21.5 % to 40.8 %.

Figure. Reed canary grass (*Phalaris arundinacea*) at flowering stage.

3. Results

Methane production of all crop samples started without delay. Samples at generative stages in both years had the highest methane yields (340 – 350 lCH_4/kg of volatile solids $(VS)_{add}$), while samples at vegetative stage in year 2005 had the lowest yield (180 $lCH_4/kgVS_{add}$).

The annual biomass yield (TS) per hectare in 2005 was 79 % higher when harvesting twice at higher degree of maturity (flowering and vegetative stages) compared to harvesting twice at earlier degree of maturity (generative and vegetative stages). Thus, the total methane yield per hectare was 64 % higher when harvesting at higher degree of maturity (Table). In 2006, harvesting at generative stage yielded 20 % more methane than harvesting at flowering stage because of same TS yields and higher methane yield of crop samples harvested at earlier maturity stage. The potential methane yields of reed canary grass per hectare per year corresponded to energy yields of 20 – 36 MWh/ha.

4. Conclusions

Methane production potential per ton of VS of reed canary grass was higher when harvested at lower degree of maturity than at higher degree, but the methane yield per hectare is also affected by the yield of biomass.

Table. Maturity stage, harvest times and days per plot, biomass and methane yields of reed canary grass.

Maturity stage and harvest times per plot	Day of harvesting	Yield (tTS/ha)	Methane prod. (m^3CH_4/ha)
Generative, 1st harvest	22.6.2005	5.2	1700
Vegetative, 2nd harvest	19.8.2005	2.9 (1st+2nd:8.1)	500 (1st+2nd:2200)
Flowering, 1st harvest	13.7.2005	10.1	2500
Vegetative, 2nd harvest	12.9.2005	4.3 (1st+2nd:14.5)	1100 (1st+2nd:3600)
Generative, 1st harvest	21.6.2006	7.8	2400
Flowering, 1st harvest	10.7.2006	7.8	2000

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