# Effect of grass silages, differing in maturity and nitrogen fertilisation, on in vitro methane production

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## Background

Methane ($CH_4$), production by has received considerable attention in recent years due its contribution to global warming. Moreover, $CH_4$ synthesis in the rumen represent a significant loss of dietary energy.

## Objectives

- To determine in vitro $CH_4$ production of grass silages differing in maturity and N-fertilisation rate when incubated with rumen fluid from donor cow adapted to specific feed & non-adapted rumen inoculum from cows not adapted to specific feed.
- To compare in vitro results with the in vivo data on $CH_4$ production measured simultaneously using donor cows adapted to each grass silages.

## Materials & Methods

- Grass fields (predominantly rye grass) were fertilized with low N (L; 65 kg N/ha) or high N (H; 150 kg N/ha).
- each grass field was harvested at early maturity (EM), mid maturity (MM) and late maturity (LM), and ensiled.
- Donor cows were fed with these 6 grass silages (n =2 ) as part of complete ration.
- Complete ration consists of 80% (DM basis) grass silage and 20% concentrate.

**Table 1.** Effect of maturity and N-fertilization on chemical composition (g/kg of DM) of grass silages.

| | Low N | | | High N | | |
|---|---|---|---|---|---|---|
| | EM | MM | LM | EM | MM | LM |
| DM yield (kg/ha) | 2023 | 3214 | 3535 | 2055 | 3609 | 5796 |
| OM | 903 | 924 | 934 | 895 | 902 | 914 |
| CP | 149 | 106 | 78 | 197 | 173 | 120 |
| Sugars | 98 | 190 | 179 | 54 | 79 | 69 |
| NDF | 476 | 501 | 561 | 459 | 507 | 603 |
| ADF | 282 | 288 | 315 | 280 | 298 | 353 |
| ADL | 20 | 24 | 26 | 21 | 22 | 32 |

- Gas production was measured using a fully automated system (Cone et al., 1996).
- In vitro $CH_4$ production was measured using automated gas production techniques as described by Pellikaan et al. (2011).
- In vivo $CH_4$ data were measured in climate controlled respiration chambers.

## Conclusions

- Gas production decreased with advancing maturity.
- $CH_4$ production was affected by maturity and N fertilisation.
- In vitro $CH_4$ production showed a weak correlation with the in vivo $CH_4$ expressed in (ml/g OM).

## Results

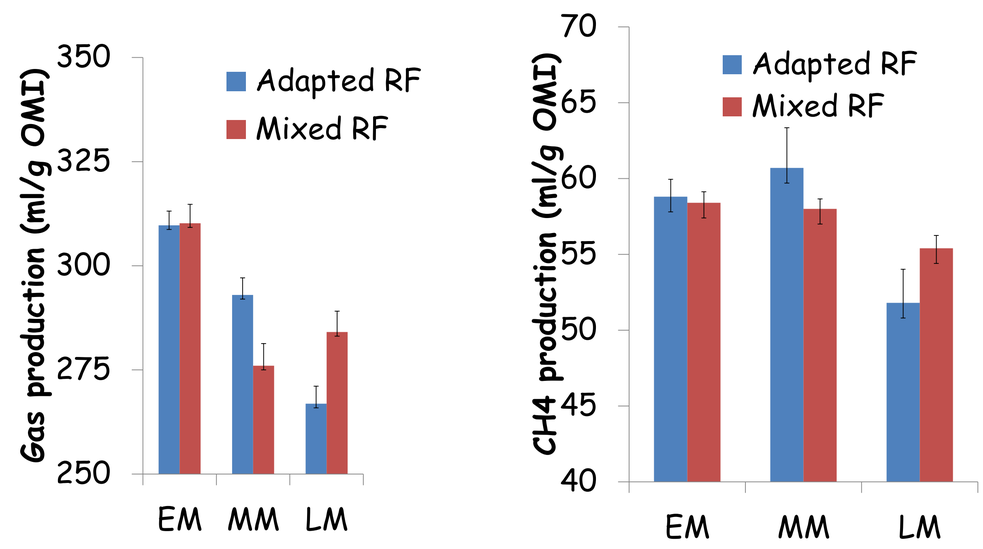


Figure.1 . Gas and $CH_4$ production of grass silages differing in maturity after 72h of incubation either adapted or mixed rumen fluid.

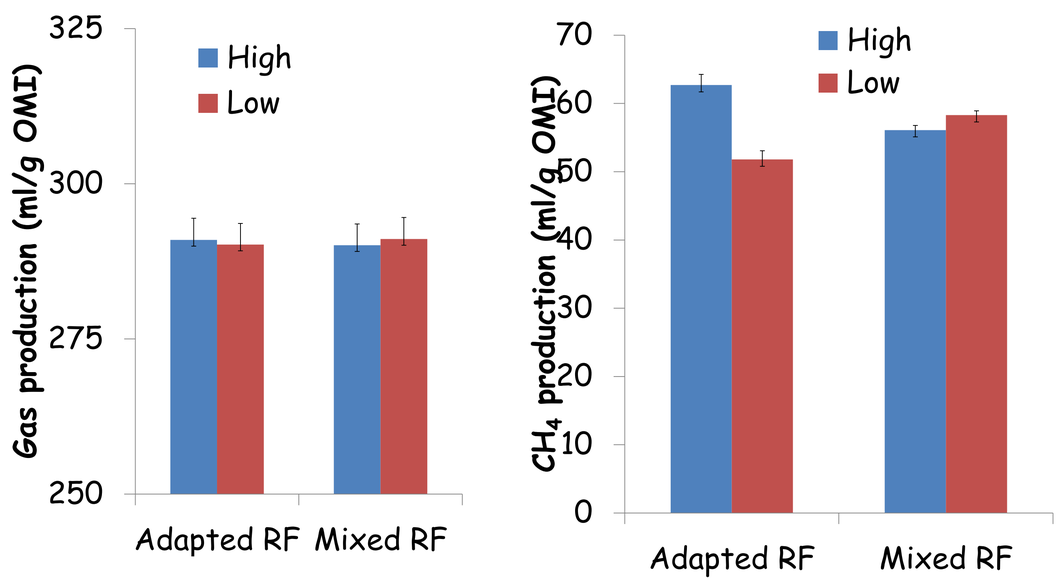


Figure 2. Effect of fertilisation level of grass silages on gas and $CH_4$ production after 72h of incubation either adapted or mixed rumen fluid.

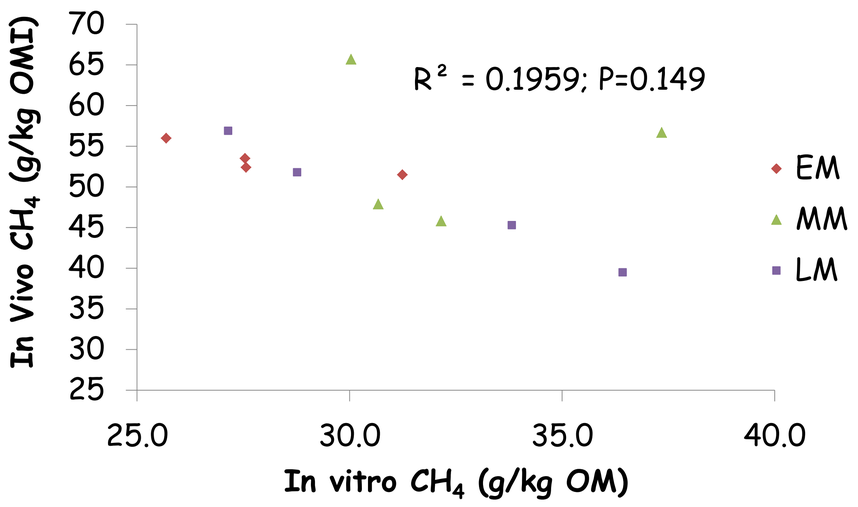


Figure 3. Relationship between in vivo and in vitro $CH_4$ measured from cows fed grass silages differing in maturity and N fertilisation rates.

## References

Cone et al. (1996) Anim. Feed Sci. Technol. 61, 113-128.
Pellikaan et al. (2011). Anim.Feed Sci. Tecnol. 168, 196-205.