Bavarian State Research Center for Agriculture

Institute for Agricultural Engineering and Animal Husbandry

Studies on the influence of moulded feedstocks on the biogas process and the mycotoxicological status of digestates

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Motivation

- High-quality **substrates** **contribute** significally to the **efficiency** of the overall system
- Use of **material unsuitable** for **animal feed** for energy supply and revaluation the value-added chain

Hypotheses

- **Substandard ensiling** can result in spoilage by **mycotoxin producing fungi**
- There are indications, that **secondary metabolites** formed by moulds can **impede the activity** of microorganisms in biogas plants
- **Mycotoxins** are **not metabolised** during fermentation

Experimental Setup

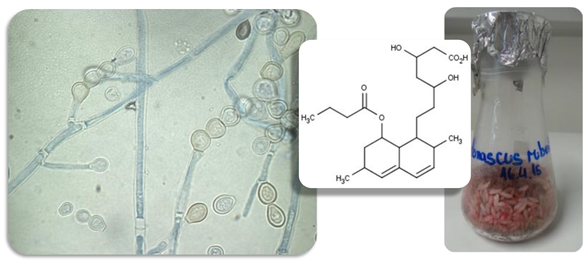


Fig. 1: *Monascus ruber* 1000-fold magnification, the chemical structure of monacolin KS and the extract of fungal culture of *Monascus ruber* cultivated on rice

Fig. 2: *Penicillium roqueforti* 1000-fold magnification, the chemical structure of roquefortine C and the extract of fungal culture of *Penicillium roqueforti* cultivated on rice

Fig. 4: With *Monascus ruber* artificially moulded maize silage

Fig. 5: With *Penicillium roqueforti* artificially moulded maize silage

Minibatch-Tests

- **Toxins** in **pure form** in different concentrations
- **Toxins** as **extract** from fungal cultures

→ Gas production, gas quality

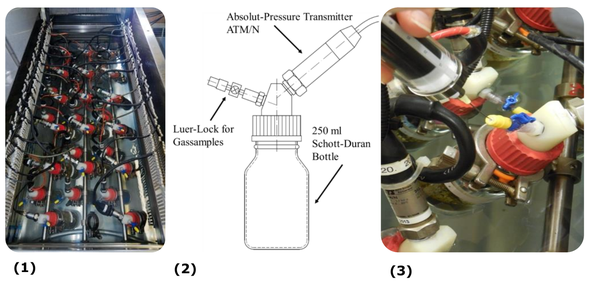


Fig. 3: Minibatch-System (Technical drawing: KAMMERLOHER, 2013; Photos: HARTEL, 2015): (1) Waterbath with clamped bottles and swivel mechanism; (2) schematic view of the bottle with pressure transmitter and (3) luer lock for sampling the headspace volume

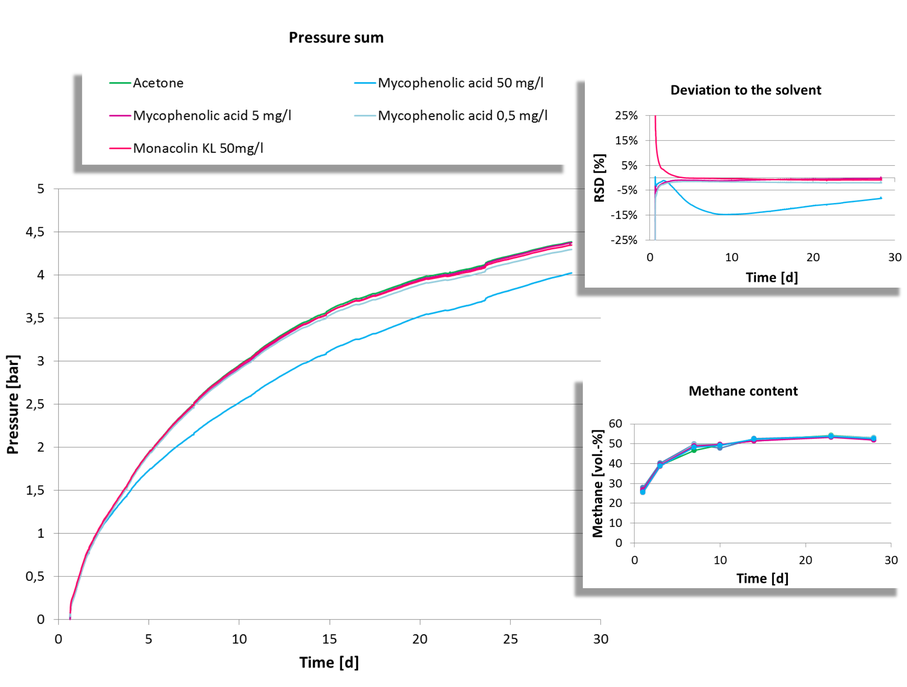
Loading Test

- Increasing the organic loading rate with **moulded silages**

→ Biogas quality
→ Methane productivity
→ Microbiological activity
→ Fate of mycotoxins in digestate

Fig. 6: 36 Liter flow through digesters.

Results



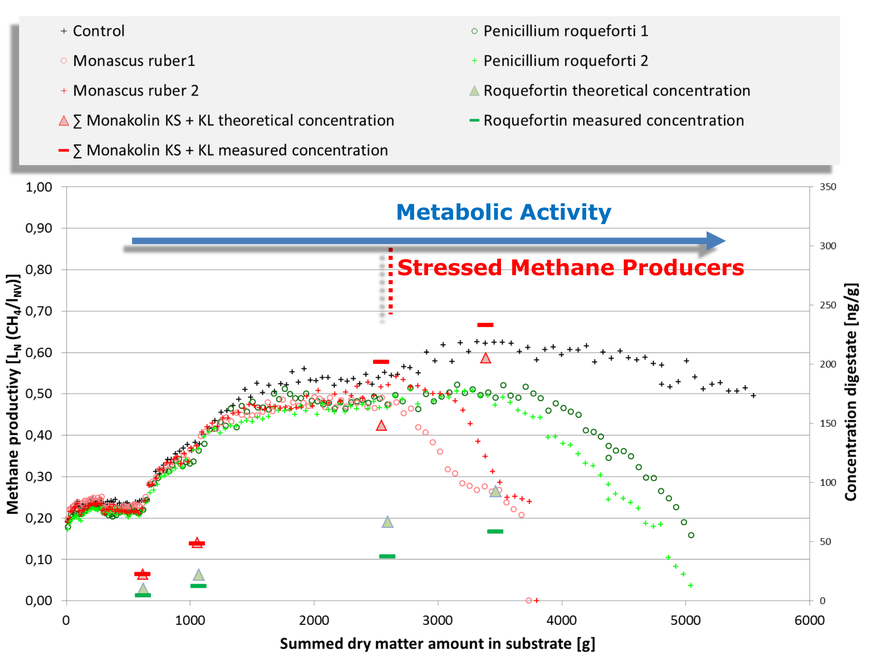
Outcome

Minibatch

- From the tested mycotoxins, **only mycophenolic acid** affected the biogas productivity significantly

Loading Test

- **Conventional** chemical and microbiological **analysis can not explain the disturbance** of the methane productivity
- For the investigated **toxins** the **concentration increased**



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Government-funded

Bayerisches Staatsministerium für Wirtschaft und Medien, Energie und Technologie