Effect of mixed microbial culture treatment on the nutritive value of coffee, green tea, and oolong tea residues and the effect of the fermented residues on \textit{in vitro} rumen fermentation

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Introduction

- Nowadays, livestock farmers are facing the difficulties to acquire affordable feedstuff.
- Agricultural by-products are one of the solutions.
- However, these feed sources are usually of low quality

Coffee | Oolong tea | Green tea
Annual world coffee production is 0.8 m tons (ICO, 2010)
Annual world tea production is 2.9 m tons (FAO 2000)
In Japan, beverage companies annually produce 0.1 m tons of tea & 0.2 m tons of coffee annually

A large quantity of beverage by-product released into the environment

**Causing economic & environment problems.**

Need effective utilization method

1. Animal feed  
2. Compost  
3. Bio-fuel
Objectives

1. To evaluate the nutritive value of mixed microbial culture contained on coffee, green and oolong tea residues.

2. To measure *in vitro* methane production and other fermentation characteristics of fermented coffee, green and oolong tea residues using continuous gas quantification system.
Materials and Methods
Exp. 1: Fermentation of beverage residues
Coffee, green and oolong tea + 2 % MMC*

DM, CP, NDF, ADF, OM (%)
saccharide & ethanol
(Unfermented)

Fermentation
Anaerobically -3 d
Aerobically -2 wks
@ temperature 35° C

DM, CP, NDF, ADF, OM (%)
saccharide & ethanol
(Fermented)

* Bacillus spp., Lactobacillus spp.,
Streptococcus spp., Nitrobacter spp.,
Methanotroph spp., Sulfer reducing
bacteria., Yeast. (Marubeni
corporation, Japan)

Exp. 2

In vitro continuous gas quantification system
Exp. 2: *In vitro* fermentation of fermented beverage residues

- Oolong tea TMR (10g): 5g, 3g, 2g
- Control TMR (10g): 5g, 5g
- Green tea TMR (10g): 5g, 3g, 2g
- Coffee-TMR (10g): 5g, 3g, 2g

NH$_3$-N, VFAs, CH$_4$

*In vitro* continuous gas quantification system

*TMR: Total Mixed Ration*
In vitro gas continuous quantification system

Control TMR  Coffee TMR  Oolong tea TMR  Green tea TMR

10 g sample, 160 ml rumen fluid, 640 ml buffer,

\[ \text{CH}_4 \text{ gas– Infrared analyzer} \]
Results
Exp. 1: Saccharide and ethanol concentrations of unfermented and fermented beverage residues.
CP, NDF, ADF, OM Exp. 1: composition of unfermented and fermented beverage residues.
Exp. 2: VFA concentration in the incubation medium after 24 h incubation
Exp. 2: Ammonia–N concentration in the incubation medium after 24 h incubation.
Exp. 2: Methane output after 24 h incubation.

Treatment effect: $P>0.05$
Conclusion

Green tea and oolong tea residues are good source of protein and energy as ruminant feed.

Coffee, oolong and green tea residues did not effect significantly to $\text{CH}_4$ production. However, $\text{CH}_4$ was decreased numerically in coffee residues.
Thank You