



***THE EFFECTS OF RHIZOBIAL HERBS ON IN VITRO
RUMEN FERMENTATION PROFILES IN CATTLE***

SHAKIRAH BINTI RAZLAN

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SHAKIRAH BINTI RAZLAN

FACULTY OF AGRICULTURE

UNIVERSITI PUTRA MALAYSIA

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By

SHAKIRAH BINTI RAZLAN

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CERTIFICATION

This project entitled “The Effect Of Rhizobial Herbs On *In Vitro* Rumen Fermentation Profiles In Cattle” was prepared by Shakirah Binti Razlan and submitted to the Faculty of Agriculture in fulfillment of the requirement of the course SHW 4999 (Final Year Project) for the award of the degree of Bachelor of Agriculture (Animal Science).

Student’s name:

Student’s signature:

SHAKIRAH BINTI RAZLAN

166952

Certified by:

DR. ANJAS ASMARA BIN SAMSUDIN

Project Supervisor

Department of Animal Science

Faculty of Agriculture

University Putra Malaysia

Serdang Selangor.

Date : _____

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LIST OF ABBREVIATIONS

%	percentages
°C	degree Celcius
ADF	Acid Detergent Fibre
ADL	Acid Detergent Lignin
CP	Crude protein
DM	Dry matter
OM	Organic matter
g	gram
H ₂ SO ₄	sulphuric acid
ml	milimeter
NDF	neutral detergent fiber
SAS	statistical analysis system
SE	standard error

ABSTRACT

THE EFFECT OF RHIZOBIAL HERBS ON *IN VITRO* RUMEN FERMENTATION PROFILES IN CATTLE

NAME OF STUDENT: SHAKIRAH BINTI RAZLAN (166952)

NAME OF SUPERVISOR: DR. ANJAS ASMARA SAMSUDIN

Keywords: *In vitro* gas production, ammonia concentration, volatile fatty acids.

Rhizobial herb such as turmeric (*Curcuma longa*), ginger (*Zingiber officinale*), galangal (*Alpinia galangal*) and Javanese ginger (*Curcuma zanthorrhiza*) have a lot of health beneficial used not only for human, but also for animal, and those rhizobial herbs were selected in this research. The objectives of this research was to study the effect of feeding different type of rhizobial herbs on *in vitro* rumen fermentation of cattle. The method that has been used for this reseach is by using *in vitro* rumen fermentation, where the environmental condition of the rumen is created like the real rumen environment, including the temperature and anaerobic condition. The gas production produced during fermentation was measured for every 2 hours for 24 hours. These rhizobial herbs were mixed as a supplement of the basal diet (control diet) which were rice straw and concentrate. The comparison is done between rhizobial herbs and control diet. The *in vitro* dry matter digestibility and fermentation profiles that includes pH, total gas production, volatile fatty acids (VFA) and concentration of ammonia were analysed. Proximate analysis were done to determine the chemical composition of the

samples used in this study. The dry matter (DM), ash, crude protein (CP), acid detergent fiber (ADF), neutral detergent fiber (NDF) and acid detergent lignin (ADL) were evaluated. There are 3 replicates for each treatment and the experiment is run for two times. The data collected was then analyzed using Statistical Analysis Software (SAS). For the gas production, the results shows that there were no significant difference ($P>0.05$) of the total production of gas in all different types of rhizobial herbs when compare with the control diet. The same result of no significant differences also goes to *In Vitro* Dry Matter Digestibility (IVDMD). There is also no significant differences ($P>0.05$) were observed for the rumen pH among rhizobial herbs and control diet. For the main volatile fatty acids produced in rumen, only acetic acid in turmeric have significant differences ($P<0.05$) with control diet, meanwhile other rhizobial shows no significant differences. The propionic and butyric acid in all treatment with control diet also shows no significant difference ($P>0.05$). Also, ammonia concentration shows there were no significant differences ($P>0.05$). Lastly, significant difference ($P<0.05$) were observed on nutritive values between samples and control diet for the DM, OM, CP, ADF, ADL and NDF content. Based on these results, it shows that there are only significance difference among rhizobial herbs and control diet for volatile fatty acid which is acetic acid in turmeric, and nutritive value of feed sample but no significance difference in terms of gas production, ammonia concentration, pH, rate of digestion, IVDMD, propionic acid and butyric acid. Futher study can be done by differs the percentage on supplementation rhizobial herbs in the feed that may give effect on the digestibility as a recommendation. Microbial population parameter was suggested to be added in the future study as microbial population also a major contribution to ruminal fermentation.

ABSTRAK

KESAN HERBA-HERBA RIZOM KEPADA PROFIL PENAPAIAN RUMEN *IN VITRO* LEMBU

NAMA PELAJAR: SHAKIRAH BINTI RAZLAN (166952)

NAMA PENYELIA: DR. ANJAS ASMARA SAMSUDIN

Kata kunci: Produksi gas *in vitro*, kepekatan ammonia, asid lemak meruap

Herba rizom mempunyai banyak manfaat kesihatan bukan sahaja untuk manusia, tetapi juga untuk haiwan, dan yang herba-herba rizom ini dipilih untuk penyelidikan ini. Empat jenis herba rizom yang terpilih ialah *Curcuma longa* (kunyit), *Zingiber officinale* (halia), *Alpinia galangal* (lengkuas) dan *Curcuma zanthorrhiza* (temulawak). Objektif penyelidikan ini adalah untuk mempelajari kesan herba-herba rizom ini pada profil penapaian rumen lembu secara *in vitro*. Kaedah yang telah digunakan untuk kajian ini ialah dengan menggunakan penapaian rumen secara *in vitro*, di mana keadaan persekitaran rumen diwujudkan seperti persekitaran rumen yang sebenar, termasuk suhu dan keadaan anaerobik. Pengeluaran gas yang terhasil sepanjang penapaian cecair rumen telah disukat pada setiap 2 jam selama 24 jam. Herba-herba rizom ini dicampur sebagai suplemen tambahan kepada diet asas (diet kawalan) di mana terdiri daripada jerami padi dan konsentrat. Perbandingan dibuat antara herba-herba rizom dengan diet kawalan. Kebolehcernaan bahan kering *in vitro* dan profil penapaian termasuk pH, jumlah pengeluaran gas, asid lemak meruap (VFA)

dan kepekatan ammonia telah dianalisis. Analisis proksimat telah dilakukan bagi menentukan komposisi kimia sampel yang digunakan dalam kajian ini. Bahan kering, abu, protein kasar (CP), serat asid detergen (ADF), serat detergen neutral (NDF), dan lignin asid detergen (ADL) telah dinilai. Terdapat 3 replika untuk setiap rawatan dan eksperimen diulangi sebanyak dua kali. Data dikumpulkan dan kemudian dianalisis menggunakan "Statistical Analysis Software" (SAS). Untuk pengeluaran gas, keputusan menunjukkan yang tidak ada perbezaan nyata ($P > 0.05$) dalam jumlah pengeluaran gas di antara jenis herba-herba rizom apabila dibandingkan dengan diet kawalan. Keputusan yang serupa juga iaitu tiada perbezaan nyata dari segi Pencernaan Bahan Kering *In Vitro* (IVDMD). Untuk penapaian rumen, kadar penghadaman antara herba-herba rizom dengan diet kawalan juga tidak nyata ($P > 0.05$). Begitu juga tiada perbezaan nyata ($P > 0.05$) telah diperhatikan untuk pH rumen di kalangan herba-herba rizom dan diet kawalan. Untuk asid lemak meruap yang utama dihasilkan dalam rumen, asid asetik dalam kunyit adalah satu-satunya yang mempunyai perbezaan nyata ($P < 0.05$) antara herba-herba rizom dengan diet kawalan, sementara itu herba-herba lain tidak menunjukkan perbezaan yang nyata. Tambahan pula, asid butirik dan asid propionik menunjukkan tiada perbezaan nyata ($P > 0.05$) di antara herba rizom dengan diet kawalan. Seterusnya, kepekatan ammonia juga turut menunjukkan tiada perbezaan nyata ($P > 0.05$). Akhir sekali, terdapat perbezaan nyata ($P < 0.05$) yang telah diperolehi di antara sampel dan diet kawalan untuk nilai nutrien sampel seperti DM, OM, CP, ADF, ADL and NDF. Berdasarkan keputusan-keputusan ini, kajian menunjukkan bahawa hanya ada perbezaan nyata antara herba-herba rizom dan diet kawalan untuk asid lemak meruap iaitu asid asetik dalam kunyit, dan nilai nutrien sampel makanan tetapi tiada perbezaan nyata dalam soal pengeluaran gas, kepekatan ammonia, pH, kadar penghadaman, IVDMD, asid propionik dan asid butirik. Kajian selanjutnya pada masa akan datang boleh dilakukan dengan membezakan peratusan herba-herba rizom

sebagai suplemen di mana ia mungkin boleh memberi kesan pada penghadaman, kepekatan ammonia atau parameter lain. Parameter tentang populasi mikrob adalah digalakkan untuk ditambah bagi kajian akan datang kerana populasi mikrob juga merupakan faktor utama yang menyumbang kepada proses penghadaman dalam rumen.



CHAPTER 1: INTRODUCTION

Common herbs and spices could help protect against certain chronic conditions, such as cancer, diabetes, and heart disease. Rhizobial herb such as turmeric, ginger, galangal and Javanese ginger have a lot of health benefits used not only for humans, but also for animals, and those rhizobial herbs will be focused on this study. Turmeric or *Curcuma longa* is a bright yellow aromatic powder obtained from the rhizome of the plant of the ginger family, and widely used for colouring and flavouring in Asian cookery and formerly as a fabric dye. It contains curcumin, a cancer-fighting compound. It is more often taken medicinally for its ability to reduce inflammation and improve joint. *Zingiber officinale* or what people usually known as ginger, is a hot, fragrant spice made from the rhizome of a plant, which may be chopped for cooking, preserved in syrup, or candied. Ginger is commonly used to treat many kinds of stomach problem, including motion sickness, colic, upset stomach, gas, diarrhea, and loss of appetite.

The galangal is an herb belongs to rhizome family and botanically known as *Alpinia galangal*. This tuber is known to have numerous medicinal and health benefits. Galangal contains anti-inflammatory properties and therefore useful in the treatment of arthritis and rheumatoid arthritis. It is also beneficial to relieve discomfort caused due to inflammation of the abdomen and ulcers too. *Curcuma zanthorrhiza*, known as Javanese ginger or temulawak, is a plant species belonging to the ginger family. It is known as koneng gede in Sundanese and in Madurese as temu labak. Javanese ginger was known as medicinal herb for a long time. It was believed to have anti-aging effect, remove skin fleck and improve muscle flexibility. It is also believed to be the cured for the kidney diseases, stomachache, and constipation.

1.1 Objectives

The general objective of this research is to study the effect of different type of rhizobial herbs on *in vitro* rumen fermentation profiles.

The specific objectives for this research were:

1. To compare the effects of 4 different types of rhizobial herbs, which are ginger, turmeric, galangal and Javanese ginger as a substrate on rumen pH.
2. To compare the effects of 4 different types of rhizobial herbs, which are ginger, turmeric, galangal and Javanese ginger as a substrate on rumen VFA.
3. To compare the effects of 4 different types of rhizobial herbs, which are ginger, turmeric, galangal and Javanese ginger as a substrate on rumen ammonia concentration. .

1.2 Significance Of Study

The rhizobial herbs provide a lot of benefit of health and cure diseases. Therefore, the data obtained from this research will tell us if the used by different species of rhizobial herbs has an effect on the rumen fermentation characteristics which would help to improve the performance and productivity for the cattle.

1.3 Hypothesis

Different species of rhizobial herbs have different effects on digestibility and rumen fermentation profiles.

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