



UNIVERSITI PUTRA MALAYSIA

**COMPARISON OF DIGESTIBILITY BETWEEN DIFFERENT CULTIVAR
OF BANANA (*MUSA SAPIENTUM*) PEELS USING AN *IN VITRO* GAS
PRODUCTION METHOD**

MOHD ERFAN HAQIQUE SUHAIMI

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BY

MOHD ERFAN HAQIQUE BIN SUHAIMI

**A project report submitted to the Faculty of Agriculture, Universiti Putra
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the award of degree of Bachelor of Agriculture (Animal Science)**

**FACULTY OF AGRICULTURE
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CERTIFICATION

This project entitled “Comparison of Digestibility Between Different Cultivar Of Banana (*Musa sapientum*) Peels using an *In vitro* Gas Production Method” is prepared by Mohd Erfan Haqique Bin Suhaimi and submitted to Faculty of Agriculture in fulfilment of the requirements of the course SHW 4999 (Final Year Project) for award of degree of Bachelor of Agriculture (Animal Science).

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LIST OF ABBREVIATIONS

DM	Dry Matter
CP	Crude Protein
NDF	Neutral Detergent Fibre
ADF	Acid Detergent Fibre
ADL	Acid Detergent Lignin
EE	Ether Extract
IVDMD	<i>In vitro</i> Dry Matter Digestibility
gm	gram
mL	Mililiter
L	Liter
SPSS	Social Package For Social Sciences
N	Napier
NS	Napier and Saba peel
NP	Napier and Plantain peel
NSP	Napier, Saba peel and plantain peel

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ABSTRACT

Feed is the most important component of livestock production and it accounts up to 70 per cent of the total cost of maintenance. The increasing prices of animal feed supplements are one of the challenges facing the livestock industries all around the world. The unorthodox feed stuff used to reduce the grass and concentrate are, by using waste product as an option. The aim of this study is to measure the digestibility of banana (*Musa sapientum*) peels from different cultivar as a supplementation on top of Napier grass (*Pennisetum purpureum*) as basal feed. Gas production via *in vitro* gas production technique and *in vitro* dry matter digestibility (IVDMD) post incubation period were analysed to observe the digestibility pattern between treatments. N consist of (100% Napier grass + 0% banana peel; n=6) followed by NS consist of (85% Napier grass + 15% Saba peel; n=6), NP consist of (85% Napier grass + 15% Plantain peel; n=6), and NSP consist of (85% Napier grass + 7.5% Saba peel + 7.5% Plantain peel; n=6). There were significant ($p < 0.05$) differences between Saba peel and plantain peel in term of chemical composition. The crude protein of the peels ranged from 6.61% to 7.95% of dry matter (DM); acid detergent fibre from 26.20% to

34.48% DM and acid detergent lignin ranged 26.97% to 92.30% DM; neutral detergent fibre ranged from 46.11% to 49.06% DM. Total gas production after 72 h incubation ranged between 20 mL and 25 mL/0.2 g of substrate. At 4 and 8 h of incubation, the gas production were significantly ($p < 0.05$) different between NS and NP in which, NS produced higher gas volume at this hour compared NP. In *in vitro* dry matter digestibility (IVDMD), NS shows the highest IVDMD percentage which was 12.77%, indicate it has higher digestibility compared to other treatment. There was no correlation between parameter of gas production and IVDMD percentage due some errors during conducting the experiment. In conclusion, banana peels from different cultivars have no different rate of digestibility but NS shows higher gas production rate than NP.

**PERBANDINGAN PENGHADAMAN KULIT PISANG (*MUSA SAPIENTUM*)
DARIPADA KULTIVAR YANG BERLAINAN MENGGUNAKAN KAEDAH
PENGELUARAN GAS *IN VITRO***

OLEH

MOHD ERFAN HAQIQUE BIN SUHAIMI

ABSTRAK

Makanan merupakan komponen utama dalam produksi ternakan dan merangkumi sebanyak 70 peratus daripada jumlah kos penyelenggaraan. Industri ruminan menghadapi cabaran harga makanan tambahan haiwan di seluruh dunia. Penggunaan barangan makanan yang tidak komersial adalah dengan menggunakan rumput dan barangan buangan sebagai pilihan. Kajian ini dilakukan bertujuan untuk mengukur kadar penghadaman kulit pisang (*Musa sapientum*) daripada kultivar pisang yang berbeza sebagai suplemen rumput Napier daripada komposisi nutrien, pengeluaran gas melalui teknik *in vitro* pengeluaran gas dan *in vitro* bahan kering penghadaman (IVDMD) selepas tempoh inkubasi. Rumput Napier (*Pennisetum purpureum*) digunakan dalam eksperimen ini bertindak sebagai diet utama untuk ruminan. N terdiri daripada (100% rumput Napier + 0% kulit pisang; n = 6) diikuti oleh NS terdiri daripada (85% rumput Napier + 15% Saba kulit; n = 6), NP terdiri daripada (85% rumput Napier + 15% Plantain kulit; n = 6), dan NSP terdiri daripada (85% rumput Napier + 7.5% Saba kulit + 7.5% Plantain kulit; n = 6). Terdapat perbezaan ($p < 0.05$) signifikan di antara kulit Saba dan pisang dikupas dari segi

komposisi kimia. Protein mentah daripada kulit adalah di antara 6.61% hingga 7.95% daripada bahan kering (DM); serat detergen asid dari 26.20% hingga 34.48% DM dan asid pencuci lignin adalah di antara 26.97% hingga 92.30% DM; serat detergen neutral adalah dari 46.11% kepada 49,06% DM. Jumlah pengeluaran gas selepas jam ke 72 inkubasi adalah antara 20 mL dan 25 mL / 0.2 g substrat. Pada jam ke 4 dan jam ke 8 inkubasi pengeluaran gas secara ketara ($p < 0.05$) berbeza antara NS dan NP, dimana NS menghasilkan lagi banyak gas berbanding NP. *In vitro* kering perkara penghadaman (IVDMD), NS menunjukkan peratusan tertinggi IVDMD yang merupakan 12.77%, menunjukkan bahawa ia mempunyai penghadaman yang lebih tinggi berbanding dengan rawatan lain. Tidak ada hubungan antara parameter dari segi pengeluaran gas dan IVDMD peratusan disebabkan oleh beberapa kesilapan semasa menjalankan eksperimen. Kesimpulannya, kulit pisang daripada kultivar yang berbeza, tidak mempunyai kadar yang berbeza penghadaman tetapi NS menunjukkan kadar penghasilan gas yang lebih tinggi berbanding NP.

CHAPTER 1

INTRODUCTION

Highly cost of feed to livestock is one of the biggest challenges facing the farmers. The increasing prices of animal feeds supplements are one of the challenges facing the livestock industries all around the world. The surging prices of animal feed supplements are one of the challenges facing the livestock industries all around the world (Saheed et al., 2013). Moreover, the farmers needed major labour to plan and harvest grasses. Small scale farmers', who lack sufficient pasture land, have to use alternative feed such as, concentrate feed but it is too costly. Concentrate feed is a high-priced, which can be one of the reasons of low production of the industry.

The unorthodox feed stuff to reduce the grass and concentrate are, by using waste product as an option. There are a great deal of waste product that can be re-used as ruminant feed stuffs such as rice straw, guava, jackfruit, date fruit, citrus peel and banana peel. Disposal of fruit wastes, whether from the kitchens, fruit stalls or juice dealers in Malaysia is considered as agriculture by-products and also could become another feed source for the ruminants. As the alternative to recycle environmental wastes, fruit peels used as partial replacement or as a supplementation for main feed of the ruminant, which is grasses to reduce cost of feed animal production. Banana peels can be converted into livestock feeds, which eventually provide protein and other nutrient to human from the consumption of meat and other product derived from the animals (Adebayo et al., 2007). Besides that, the banana peels are highly abundant and are being thrown by fried bananas stall, bakery shop, and banana chips industry.

It is estimated Malaysia produced 671,980.00 tons of banana in year 2012 (FAOSTAT, 2014).

The banana peel is acceptable as feed or supplemental feed for ruminant. Based on Domingue (1991), goats would use low quality fibrous feed more efficiently. Therefore, any fibrous feed such as banana peels can be introduced to goats or other ruminants. Banana peels are widely used in small scale, marginal and endless farmers as complementary feed for ruminants in tropics climate especially in India (Wadhna et al., 2013). In grass-fed zebus, the addition of 15 – 30 % banana peels in diet increased weight significantly without causing health problem or affecting palatability (Dormond et al., 1998).

This study also will provide the information of nutrient content of peels from two different cultivar of banana. Besides that, fruit by-product should not be a waste, but must use wisely to avoid loss.

Research hypothesis

1. Peels of banana from different cultivars have a different level of nutrient which may give different rate of digestibility.
2. To maximise the use of various banana peels as a supplementation especially for ruminant.

Objectives

To measure the digestibility peels of banana (*Musa sapientum*) from two different cultivars via *in vitro* gas production technique.

Specific objectives

1. To investigate the digestibility of peels of banana (*Musa sapientum*) from different cultivars as supplementation by measuring gas production under anaerobic condition.
2. To compare the digestibility between treatments with different level of banana peels percentage combined with Napier grass (*Pennisetum purpureum*) as roughage source for goat.
3. To measure *in vitro* dry matter digestibility (IVDMD) at post *in vitro* gas production.

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