UNIVERSITI PUTRA MALAYSIA

THE EFFECT OF HEART OF OIL PALM (*Elaeis guineensis*) AND INNER STEM OF BANANA STALK (*Musa sapientum*) ON RUMEN FERMENTATION PROFILES AND KINETICS IN CATTLE

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By

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A project report submitted to the

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CERTIFICATION

This project entitled "The Effect of Heart of Oil Palm *(Elaeis guineensis)* and Inner Stem of Banana Stalk *(Musa sapientum)* on Rumen Fermentation Profiles and Kinetics in Cattle" is prepared by Rabiatul Adawiyah Bt Abdul Mahaidin 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).

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LIST OF ABBREVIATION

ADF	Acid Detergent Fibre
ADL	Acid Detergent Lignin
CF	Crude Fibre
CP	Crude Protein
DM	Dry Matter
IVDMD	*In Vitro* Dry Matter Digestibility
NDF	Neutral Detergent Fibre
OM	Organic Matter
OPF	Oil Palm Fronds
OPT	Oil Palm Trunks
PKC	Palm Kernel Cake
PKE	Palm Kernel Expeller
PPF	Palm Pressed Fibre
POS	Palm Oil Sludge
VFA	Volatile Fatty Acid

ABSTRACT

Oil palm *(Elaeis guineensis)* are known for its uses for both humans and animals. For animals feed, oil palm products include palm kernel cake (PKC), palm kernel expeller (PKE), and other oil palm by product. Many parts from the oil palm tree are been utilized but there are no utilization of the heart of oil palm. Banana *(Musa sapientum)* tree is known to have a lot of medicinal and nutritive value from all parts of the tree. Previous studies suggest the important of using different parts of banana tree for animal feed. The inner stem of banana stalk are usually been made into food for human rather than for animals. This study was conducted to evaluate the effect of heart of oil palm and inner stem of banana stalk on rumen fermentation profiles in cattle. For inner stem of banana, the nutrient composition are 5.91% of dry matter (DM), 6.43% of ash (OM), 2.86% of crude protein (CP), 10.05% of crude fiber (CF) and -0.33% of ether extract (fat) and have energy 12081 kJ. For heart of oil palm, the nutrient composition are 7.68% of dry matter (DM), 7.15% of ash (OM), 17.59% of crude protein (CP), 8.17% of crude fiber (CF) and 2.87% of ether extract (fat) and have energy 13034.67 kJ. The gas production of inner stem of banana and heart of oil palm were increasing during the 96 hours. There are no significance different in the digestibility of the samples and the control samples.

ABSTRAK

Kelapa sawit *(Elaeis guineensis)* terkenal dengan kegunaannya untuk kedua-dua manusia dan haiwan. Bagi pengeluaran untuk makanan haiwan, contohnya keluaran kelapa sawit seperti 'palm kernel cake' (PKC), 'palm kernel expeller' (PKE) dan lain-lain. Pelbagai sumber daripada pokok kelapa sawit yang telah digunakan tetapi tiada pengunaan daripada umbut kelapa sawit. Selain itu, pokok pisang *(Musa sapientum)* juga diketahui mempunyai banyak kebaikan untuk sumber perubatan dan mempunyai khasiat pemakanan dari semua bahagian pokok itu. Terdapat banyak kajian yang telah dilakukan dengan menggunakan sumber bahan daripada bahagian-bahagian yang berbeza daripada pokok pisang untuk dijadikan sebagai makanan haiwan. Namun begitu, umbut pisang biasanya menjadi sumber sebagai makanan manusia dan bukannya untuk makanan haiwan. Kajian ini dilakukan untuk menilai kesan umbut kelapa sawit dan umbut pisang ke atas profil fermentasi rumen lembu. Umbut pisang mempunyai khasiat pemakanan yang terdiri daripada 5.91% daripada kandungan bahan kering (DM), 6.43% daripada kandungan abu (OM), seterusnya 2.86% daripada kandungan protein mentah (CP), 10.05% daripada kandungan gentian kasar (CF) dan -0.33% daripada kandungan lemak kasar serta mempunyai kandungan tenaga, 12081 kJ. Selain itu, untuk umbut kelapa sawit pula, khasiat pemakanannya terdiri daripada 7.68% sumber kandungan bahan kering (DM), 7.15% daripada kandungan abu (OM), serta 17.59% daripada kandungan protein mentah (CP), 8.17% daripada kandungan gentian kasar (CF) dan 2.87% daripada kandungan lemak kasar dan juga mempunyai kandungan tenaga, 13034.67 kJ. Pengeluaran gas daripada umbut pisang dan umbut kelapa sawit juga meningkat

sepanjang 96 jam. Tiada perbezaan yang signifikan dalam penghadaman sampel dan sampel kawalan.

CHAPTER 1

INTRODUCTION

Elaeis guineensis or commonly been called as oil palm, African oil palm or macaw-fat is a tree that will reach a height of 20 m or more at maturity. Oil palm tree has a trunk that is sturdy and upright, covered by the leaf-bases above, bare below, dark grey-brown and ringed. The leaves of the oil palm tree are large, with a broad base and a spiny, fibrous projections exist along the leaf margins from the leaf sheath. Oil palms were introduced to Malaysia in 1910 by Scotsman William Sime and English banker Henry Darby as an ornamental plant. The species that introduce to Malaysia was from the Eastern Nigeria. Oil palm cultivation increased significantly under the government diversification program in the early 1960s, to reduce Malaysia's dependency on rubber and tin. In 2012, the Malaysian oil palm industry employed an estimated 491,000 workers. There are many oil palms by products used for both human and animals. As for animals feed, oil palms by product include palm kernel cake (PKC), palm kernel expeller (PKE), palm pressed fiber (PPF), palm oil sludge (POS), oil palm trunks (OPT) and oil palm fronds (OPF). Heart of oil palm usually been harvested from the shoots of the oil palm tree or from the trunks of the oil palm tree. Heart of palm usually located at the shoots of the palm tree.

The banana tree (*Musa sapientum*) is known to have a lot of medicinal and nutritive value from all parts of the tree except from the roots and suckers. The inner stem of banana tree is tender and very fibrous. Many researches have been made

using all parts of the banana tree as feed in livestock. There are various types of banana materials been feed to livestock such as fresh, green, chopped or unchopped green banana fruits with peels, ripe, raw whole banana or plantain fruits and dehydrated, miled, green and ripe plantain or banana peels in certain Asian countries including India and Philippines (Babatunde, 1992).

Both banana inner stem and heart of oil palm are high in carbohydrates, potassium and vitamin B-6. Banana stem contains 6% of dry matter (DM), 0.8% of crude fiber, 0.9% of ash and 0.2% of crude protein (Babatunde, 1992).The oil palm trunks contains 27.5% of dry matter (DM), 37.6% of crude fiber, 2.8% of ash and 2.8% of crude protein (Wong *et al*., 2010).

1.1 Objectives

1.1.1 General objective

To evaluate the effect of heart of oil palm and inner stem of banana stalk on rumen fermentation profiles in cattle.

1.1.2 Specific objective

1) To determine the nutrient composition in term of dry matter (DM), ash (OM), crude protein (CP) and ether extract (fat) of heart of oil palm and inner stem of banana stalk.
2) To determine the fiber content of heart of oil palm and inner stem of banana stalk using Van Soest Method.
3) To evaluate *in vitro* fermentation of heart of oil palms and inner stem of banana stalk in rumen fermentation using the Menke and Steingess *in vitro* method.

1.2 Research problem

Malaysia lack of local livestock feed and resources, hence by giving the inner stem of the banana stalk and heart of palm, it could help increase the resources and lower the waste production in banana and palm oil plantation.

1.3 Hypothesis

Amount of carbohydrates in the inner stem of banana stalk and heart of oil palm utilized by the rumen microorganisms affect the ruminal fermentation and kinetics profiles in cattle.

1.4 Significance of study

The heart of oil palm and inner stem of banana stalk are both high in carbohydrates. Carbohydrates will be broken down by rumen microbial fermentation into simple sugar and these sugar will be used by the microbes and make the end products that will be used by the cattle.

By giving the heart of palm and inner stem of banana stalk it will improves the production of the end product in needed by the rumen fermentation.

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