



UNIVERSITI PUTRA MALAYSIA

**COMPARISON OF FATTY ACIDS PROFILE ON *IN VITRO* GASTRIC
DIGESTION OF RAW MILK OF COW AND GOAT WITH PANCREATIC
LIPASE**

YUSMALAILI YASRI

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BY

YUSMALAILI YASRI

170462

**A project report submitted to Faculty of Agriculture, Universiti Putra Malaysia, in
fulfillment of the requirement of SHW4999 (Final Year Project) for the award of
degree in BACHELOR OF AGRICULTURE (ANIMAL SCIENCE)**

**Faculty of Agriculture
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CERTIFICATION

The project report entitled ‘Comparison of Fatty Acid Profile on *In Vitro* Gastric Digestion Raw Milk of Cow and Goat with Pancreatic Lipase’ was prepared by Yusmalaili Binti Yasri and reported and submitted to the Faculty of Agriculture in partial fulfillment of the requirement of SHW4999 (Final Year Project) for the award of the degree in **Bachelor of Agriculture (Animal Science)**.

Student’s name:

Student’s signature

Yusmalaili Yasri
170462
Bachelor of Agriculture (Animal Science)
yusmalailiyasri@gmail.com

Certified by:

.....
Assoc. Prof. Dr. Halimatun Yaakub
Supervisor
Department of Animal Science
Faculty of Agriculture
Universiti Putra Malaysia.

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ABSTRACT

The main objective of this study was to determine the milk composition of raw milk of cow and goat. The specific objectives were to determine and compare the fatty acids profiles during *in vitro* gastric digestion of raw milk of cow and goat and at different time of digestion. Approximately 700 ml of milk bulk samples from cow (Ladang 16, UPM) and goat (Nilai Dairy Farm, Negeri Sembilan) were collected on the same day, without considering the breed, number of lactation and type of diet or other factors that might influence the milk composition. Both samples were analyzed for fat, protein, lactose and total solid content using milk. Balance of the milk samples then undergo *in-vitro* gastric digestion for 3 hours, to mimics the digestion of fats in human digestive system. During the 3 hours of *in-vitro* gastric digestion, samples were withdrawn at every 30 minutes intervals. Digested samples then undergoes the extraction and digestion processes prior to Fatty Acids Methyl Esters (FAME) by using chloroform-methanol. Fatty acids profiles in prepared samples were determined using Gas Chromatography machine (GC) 6890N Version N.04.08 (Agilent Technologies Inc., USA) fitted with HP-88 silica capillary column (100 m X 0.250 mm X 0.20 μ m) (Agilent Technologies Inc., USA). The results of milk composition in cow and goat milk were significant different ($P < 0.05$) for fat (4.41%; 3.09%), protein (3.08%; 2.66%), lactose (4.86%; 4.35%) and total solid (12.95%; 10.72%), respectively. The results on fatty acid profiles on *in vitro* gastric digestion was expected to reflect on milk composition especially on fat content when goat milk was observed high in beneficial fatty acids and highly digestible than cow milk.

ABSTRAK

Objektif utama projek ini ialah untuk penentuan komposisi susu mentah daripada lembu dan kambing. Objektif sampingan adalah untuk menentukan serta membandingkan profil asid lemak semasa proses pencernaan mimic pencernaan gastrik terhadap susu mentah daripada lembu dan kambing pada masa pencernaan yang berbeza. Lebih kurang 700 ml contoh susu lembu (Ladang 16, UPM) and kambing (Ladang Kambing Nilai, Negeri Sembilan) dikumpul pada hari yang sama, tanpa mengambil kisah aspek baka, bilangan penyusuan, jenis makanan ransum atau faktor lain yang boleh memberi kesan terhadap komposisi susu. Kedua-dua contoh susu telah dianalisa untuk lemak, protein, laktos and jumlah pepejal. Lebih daripada analisa komposisi susu digunakan untuk pencernaan mimic sistem pencernaan gastrik manusia. Sepanjang 3 jam waktu pencernaan, contoh susu akan dibawa keluar pada setiap 30 minit. Contoh susu yang telah dicerna kemudian melalui proses ekstrak dan pencernaan untuk Fatty Acids Methyl Esters (FAME) dengan menggunakan chloroform-methanol. Profil asid lemak akan ditentukan oleh mesin Gas Chromatography. Keputusan komposisi susu lembu dan kambing direkodkan adalah berbeza ($P < 0.05$) untuk asid lemak (4.41%; 3.09%), protein (3.08%; 2.66%), laktos (4.86%; 4.35%) dan jumlah pepejal (12.95%; 10.72%). Keputusan profil asid lemak disasarkan berkaitan dengan komposisi susu terutamanya kandungan lemak. Susu kambing diperhatikan merekod asid lemak yang bagus tinggi dan lebih tinggi kadar pencernaannya daripada susu lembu

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LIST OF ABBREVIATION AND SYMBOL

%	Percent
°C	Degree Celsius
μL	Microliter
CLA	Conjugated Linoleic Acid
FA	Fatty Acid
FAME	Fatty Acid Methyl Ester
SFA	Saturated Fatty Acids
USFA	Unsaturated Fatty Acids
MUFA	Monounsaturated Fatty Acids
PUFA	Polyunsaturated Fatty acids
MFGM	Milk Fat Globule Membrane
mg	Milligram
v/v	Volume per volume
LDL	Low Density Lipoprotein
PL	Pancreatic Lipase
WPL	Without Pancreatic Lipase
μm	Micrometer
SIF	Simulated Intestinal Fluid

CHAPTER 1

INTRODUCTION

Milk is a complete food consist of various nutrients such as protein, fat, minerals and vitamins which are essential for human. Common sources of milk are obtained from - cattle and goat. The milk from cows has received more attention because of their commercial importance by becoming derivative products such as yogurt, cheese and powdered milk. Nowadays, the demand for milk goats is increasing due to the awareness of allergy and gastrointestinal problems in human towards cow milk. In Malaysia, milk self-sufficiency levels is estimated at 5 % (DVS, 2011) and its tend to increase in future. Therefore, it is shown that our local dairy industry is improving as they need to supply milk for local consumption instead of importing more milk from other foreign countries such as Australia.

Milk is secreted from mammary epithelial cells as globules surrounded by a membrane. This membrane play role in maintaining the integrity of the globules and causing them compatible with their aqueous environment (Keenan *et al.*, 1988). These fat globules varies between species and also influenced by diet, breed, stage of lactation and number of lactation. The variation in milk fat content and composition could influence their rate of digestibility. Milk fat is composed of a complex mixture of lipids. Triglycerides are the major type of lipid in milk fat. The milk fat has the most complex fatty acid composition of edible fats. Therefore, the purpose of this project were to improve knowledge about milk composition in our local dairy industry and provide the important facts to the consumer about the goods of milk for consumption.

The aim of this project was to determine the fatty acid profiles of cow and goat milk after *in vitro* gastric digestion.

1.1 PROBLEM STATEMENT

This project was carried out due to lack of information about fatty acid profiles between cow and goat after *in vitro* gastric digestion.

1.2 OBJECTIVES OF STUDY

The general objective of this project was to determine fatty acid profiles of raw milk after *in vitro* gastric digestion.

The specific objectives of this project were to:

1. determine fatty acid profiles at different time interval of *in vitro* digestion
2. determine milk composition of cow and goat raw milk
3. evaluate digestibility of cow and goat raw milk

1.3 SIGNIFICANCE OF STUDY

There is abundant availability of dairy products, resources from cow milk instead of goat milk on the market. Recently, availability of dairy products, resources from goat milk has increased and become the choice of consumers. By conducting this project, more details on fatty acid profiles after digestion of milk from cows and goats will be available for consumers.

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