NUTRITIVE VALUE OF MULBERRY (*MORUS ALBA*) HAY AS A FEED SUPPLEMENT FOR SHEEP

By

ARSYADI ALI

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirement for the Degree of Master of Agricultural Science

November 2006

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Agricultural Science

NUTRITIVE VALUE OF MULBERRY (*MORUS ALBA*) HAY AS A FEED SUPPLEMENT FOR SHEEP

By

ARSYADI ALI

November 2006

Chairman: Professor Zainal Aznam bin Mohd Jelan, PhD

Faculty: Agriculture

A study comprising of three experiments was conducted on the utilization of mulberry *(Morus alba)* hay as feed supplement in sheep. The first experiment determined the duration of the sun-drying of mulberry foliage until it reached 10% moisture content and the nutritive values of the hay five (W5) and seven weeks (W7) old forage. The second experiment elucidated the characteristics of the hay with respect to *in situ* degradation of dry matter (DM) and crude protein (CP). The third experiment determined the effect of supplementation of mulberry hay on the total digestibility of the ration based on oil palm frond (OPF) pellet. The drying time of W7 mulberry foliage was significantly ($P<0.05$) longer than W5. The drying time of stem was significantly ($P<0.05$) longer than leaf fraction at both ages of maturity (W5 and W7**).** The DM and neutral detergent fiber (NDF) content of mulberry was not significantly ($P>0.05$) different with advancing plant maturity, but increased significantly ($P<0.05$) with the drying process. The CP content of mulberry decreased with the plant maturity (W5 to W7) and the drying process. The ash content was affected by the advancing plant maturity, drying and plant fraction. The acid detergent fiber (ADF) and acid detergent lignin (ADL) content increased with

plant maturity (W5 to W7) and was not affected by drying. The DM degradation of mulberry harvested at 5 weeks of age and oven-dried (MHO5) and mulberry harvested at 5 weeks of age and sun-dried (MHS5) was significantly ($P<0.05$) higher than mulberry harvested at 7 weeks of age and oven dried (MHO7) and mulberry harvested at 7 weeks of age and sun-dried (MHS7) at 12, 24, 36 and 48 h of rumen incubation**.** Meanwhile, the CP degradation of MHO5, MHS5, MHO7 and MHS7 was not significantly ($P>0.05$) different at 0, 6, 12, 24, 36 and 48 h of incubation. The degradability of water insoluble (b), potential degradability (PD) and effective degradability (ED) of DM of MHO5 and MHS5 were higher than MHO7 and MHS7. Meanwhile, the PD and ED of CP were significantly ($P<0.05$) decreased with advancing plant maturity. Supplementation of mulberry hay to OPF pellet based diet from 20 to 60% increased the DM, organic matter (OM), CP, NDF digestibility, N intake and absorption and NH_3-N concentration. Increasing level of mulberry hay supplementation did not influence total dry matter intake (DMI), N retention and total volatile fatty acid (VFA). Mulberry hay of 5 weeks compared to 7 weeks old forage contained higher CP, lower cell wall and lignin content and higher DM degradability, ED and PD values. Supplementation of mulberry hay as a CP source significantly ($P<0.05$) improved the utilization of OPF pellet as base diet in sheep. However, higher level of mulberry hay supplementation is not recommended because it did not increase the total DMI and N retention.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains Pertanian

NILAI PEMAKANAN HAY MALBERI *(MORUS ALBA)* SEBAGAI SUPLEMEN MAKANAN PADA BIRI-BIRI

oleh

ARSYADI ALI

November 2006

Pengerusi: **Profesor Zainal Aznam bin Mohd Jelan, PhD**

Fakulti: **Pertanian**

Kajian terdiri daripada tiga eksperimen telah dijalankan keatas penggunaan hay malberi (*Morus alba*) sebagai suplemen makanan pada biri-biri. Eksperimen pertama menentukan masa pengeringan foliaj mulberi dengan sinaran matahari sehingga ia mencapain kandungan air 10% dan nilai pemakanan hay yang dibuat dari malberi yang dituai pada minggu kelima (W5) dan ke tujuh (W7) pertumbuhan. Eksperimen kedua menjelaskan ciri-ciri hay dari aspek degradasi DM dan protein kasar (CP) *in situ*. Eksperimen ketiga menentukan kesan suplementasi hay malberi pada jumlah keseluruhan pencernaan pelet pelepah kelapa sawit (OPF) sebagai makanan asas. Masa pengeringan foliaj malberi W7 ketara lebih lama ($P<0.05$) berbanding malberi W5. Masa pengeringan batang ketara lebih lama ($P<0.05$) berbanding daun pada kedua umur kematangan (W5 dan W7). Kandungan DM dan gentian neutral detergent malberi tidak berbeza ($P>0.05$) dengan peningkatan umur pokok, tetapi ketara meningkat ($P<0.05$) dengan proses pengeringan. Kandungan CP malberi menurun dengan peningkatan umur pokok (W5 kepada W7) dan dengan proses pengeringan. Peningkatan umur pokok, proses pengeringan dan bahagian pokok memberi kesan kepada kandungan abu. Kandungan gentian asid detergen

(ADF) dan lignin detergen asid (ADL) meningkat dengan peningkatan umur pokok (W5 kepada W7) dan tidak terkesan oleh pengeringan. Degradasi DM malberi yang dituai pada 5 minggu pertumbuhan dan dikeringakn dengan oven (MHO5) dan malberi yang dituai pada 5 minggu pertumbuhan dan dikeringan dengan sinaran matahari (MHS5) ialah ketara lebih tinggi ($P<0.05$) dibanding malberi yang dituai pada 7 minggu pertumbuhan dan dikeringkan dengan oven (MHO7) dan malberi yang dituai pada 7 minggu pertumbuhan dan dikeringkan dengan sinaran matahari (MHS7) pada masa inkubasi 12, 24, 36 dan 48 jam. Sementara itu, degradasi CP MHO5, MHS5, MHO7 and MHS7 adalah tidak berbeza ($P>0.05$) pada masa inkubasi 0, 6, 12, 24, 36 dan 48 jam. Degradabiliti insoluble (b), degradabiliti potensi (PD) dan degradabiliti efektif (ED) DM daripada MHO5 dan MHS5 adalah lebih tinggi berbanding MHO7 dan MHS7. Sementara itu, PD and ED CP adalah ketara menurun ($P<0.05$) dengan peningkatan umur pokok. Suplementasi hay malberi dari 20 kepada 60% terhadap pelet OPF sebagai diet asas meningkatkan pencernaan DM, bahan organik (OM), CP, NDF, pengambilan dan penyerapan N dan konsentrasi NH_3-N. Peningkatan paras suplementasi hay mulberi tidak mempengaruhi jumlah pengambilan bahan kering (DMI), retensi N dan jumlah asid lemak meruap (VFA). Hay malberi pada umur lima minggu mengandungi kandungan CP yang lebih tinggi, kandungan dinding sel dan lignin yang lebih rendah dan degradabiliti DM, nilai ED dan PD lebih tinggi berbanding hay pada umur tujuh minggu. Suplementasi hay malberi sebagai sumber CP telah meningkatkan dengan ketara penggunaan pelet OPF sebagai diet asas pada biri-biri. Walaubagaimanapun, suplementasi hay malberi yang lebih tinggi tidak digalakan karena ia tidak meningkatkan jumlah DMI dan retensi N.

ACKNOWLEDGEMENTS

First of all, I would like to express my sincere gratitude to Allah, the most gracious and merciful. With His blessing and grace, I am able to complete this thesis.

I would like to express my most heartfelt gratitude to my supervisor, Professor Dr. Zainal Aznam bin Mohd. Jelan for his unfailing support, advice and guidance. My deep appreciation is also extended to the member of the Supervisory Committee, Associate Professor Dr. Halimatun Yaakub for her suggestion and advice.

My deepest gratitude is extended to the Government of Riau Province who provided the scholarship, and the Rector of Universitas Islam Negeri Suska Riau, Dean and to my friends at the Faculty of Animal Science, UIN Suska Riau for their support.

I would also like to thank Professor Dr. Abd. Razak Alimon, Associate Professor Dr. Liang Juang Boo, Associate Professor Dr. Jothi Malar Panandam and En. Shokri Jusoh for their assistance. My thank also goes to the technical staff of the Animal Nutrition Laboratory. Many thank also goes to my graduate friends (Dwi Yulistiani, Devika Saddul, Boodee, Lai, Reza, Rahfi, Thanth, Imad, Elizabeth, Khaladi, Abdullah and Nwe) and housemates (Kanda Rizal Fahmi, Rizky Gushendra, Bang Jun, Pak Promadi, Eri and Eka) for their advice and support.

For their unfailing support and love, I would like to express my special gratitude to my parents, my brother, my sisters, my parents in-law and my beautiful wife. This thesis is dedicated to all of you.

I certify that an Examination Committee has met on 24 November.2006 to conduct the final examination of Arsyadi Ali on his Master of Agricultural Science thesis entitled "Nutritive Value of Mulberry (*Morus alba*) Hay as a Feed Supplement for Sheep" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 an Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

Dahlan Ismail, PhD
Professor
Faculty of Agriculture
Universiti Putra Malaysia
(Chairman)

Razak Alimon, Phd
Professor
Faculty of Agriculture
Universiti Putra Malaysia
(Internal Examiner)

Ismail Idris, PhD
Associate Professor
Faculty of Agriculture
Universiti Putra Malaysia
(Internal Examiner)

Wan Zahari bin Mohamed, PhD
Strategic Livestock Research and Development Institute
(External Examiner))

HASANAH MOHD. GHAZALI, PhD
Professor/Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

This thesis submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Agriculture Science. The members of the Supervisory Committee are as follows:

Zainal Aznam Bin Mohd Jelan, PhD
Professor
Faculty of Agriculture
Universiti Putra Malaysia
(Chairman)

Halimatun Yaakub, PhD
Associate Professor
Faculty of Agriculture
Universiti Putra Malaysia
(Member)

_____

AINI IDERIS, PhD
Professor/Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 10 March 2007

DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

_____

ARSYADI ALI

Date:

TABLE OF CONTENTS