UNIVERSITI PUTRA MALAYSIA

OIL PALM AND NIPAH FROND SILAGES AND THEIR UTILIZATION BY SHEEP

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Thesis Submitted in Fulfillment of the Requirement for the Degree of
Doctor of Philosophy in the Institute of Bioscience
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Dedication

This thesis is dedicated to all members of my family, Particularly my wife Aisha Abuzaid and our youngest daughter, Amal and all the others who showed every sort of endurance, patience and understanding during all stages of the study.

Abstract of the thesis submitted to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the Degree of Doctor of Philosophy

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Chairperson: Associate Professor Dr. Norhani Bint Abdullah

Faculty: Institute of Bioscience

A series of experiments was conducted to study the quality of silages made from oil palm (*Elaeis guineesis*) (OPF) and nipah fronds (*Nypa fruticans*) (NF) and to see the effects of adding molasses or urea on the silages. The results showed that fresh OPF had significantly ($P< 0.05$) higher dry matter (DM), ether extractives (EE) and neutral detergent fiber (NDF) than NF. The non-structural carbohydrates (NSC), ash, lignin and tannin of OPF were significantly ($P<0.05$) lower than those of NF.The crude protein (CP), pH and lactic acid of the fresh OPF and NF were similar, but the buffering capacity (BC) of the fresh OPF was significantly ($P<0.05$) lower than NF.

Anatomical investigations showed that the two types of fronds were different in their structures. In OPF, the hypodermic layer consisted of two layers of thin walled

cells, while in NF the outermost layer of the hypodermis was made up of thick walled cells. In addition, lignified palisade cells were present below the epidermis of NF, but were absent in OPF.

The pH of ensiled OPF was significantly ($P<0.01$) lower while the lactic acid higher than that of NF. Ensiled OPF had higher ($P<0.01$) BC at day 30 of ensilage than that of NF. The addition of 10% molasses increased lactic acid content of OPF but not of NF, while 3% urea added singly or with 10% molasses did not improve the ensilability of both OPF and NF. However, 30% molasses increased the lactic acid of NF from 14.2 to 50.4 g/kg DM and lowered its pH from 4.7 to 4.0 at day 30.

Digestibility studies *in situ* in sheep showed that the potential degradability of both untreated or molasses treated OPF were significantly ($P<0.01$) higher than that of NF. The rumen ammonia nitrogen concentration of sheep fed OPF silage was significantly higher than sheep fed NF silage.

In the feeding trial conducted for 63 days, lambs fed molasses treated NF silage showed significantly ($P< 0.05$) higher silage intake as well as live weight gain (LWG) than lambs fed untreated NF silage. Similarly, lambs fed molasses treated OPF silage showed higher silage intake and LWG than lambs fed untreated OPF. A regression equation to show the relationship between % potential degradability (a + b) and voluntary feed intake (VFI) in g/kg $W^{0.75}$ was 0.5 (a + b) + 51.5, ($r^2 = 0.65$).

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Doktor Falsafah

SILAJ PELEPAH KELAPA SAWIT DAN NIPAH DAN PENGGUNAANNYA SEBAGAI MAKANAN TERNAKAN BIRI-BIRI

Oleh

SIDIEG ADAM ABDALLA

April 2001

Pengerusi: Profesor Madya Dr. Norhani Bint Abdullah

Fakulti: Institut Biosains

Satu siri eksperimen telah dijalankan untuk mengkaji kualiti silaj yang dihasilkan daripada pelepah kelapa sawit (*Elaeis guineensis*)(OPF) dan pelepah nipah (*Nypa fruticans*)(NF) serta kesan penambahan molases atau urea ke atas silaj. Pengambilan OPF dan NF dilakukan sebanyak tiga kali daripada ladang berhampiaran semasa kajian dijalankan. Hasil kajian mendapati OPF segar mengandungi DM, EF dan NDF yang lebih banyak ($P<0.05$) berbanding NF, tetapi NSC, abu, lignin dan tannin OPF adalah kurang ($P<0.05$) dari NF. Kandungan CP OPF segar and NF adalah sama begitu juga nilai pH dan asid laktik tetapi BC OPF segar adalah lebih tinggi ($P < 0.05$) dari NF.

Kajian anatomi menunjukkan kedua-dua jenis pelepah mempunyai struktur yang berbeza. OPF mempunyai lapisan hipodermis yang terdiri daripada dua lapisan sel berdinding tebal. Manakala, sel palisad yang berlignin di dapati di bahagian bawah epidermis NF dan sel tersebut tidak di dapati pada OPF.

Nilai pH silaj OPF adalah lebih rendah ($P<0.01$) manakala kandungan asid laktik silaj OPF lebih tinggi berbanding NF. Silaj OPF mempunyai nilai BC yang lebih tinggi ($P<0.01$) pada hari ke 30 berbanding nilai BC silaj NF. Penambahan 10% molases meningkatkan kandungan asid laktik OPF manakala penambahan 3% urea secara berasingan atau bersama 10% molases, tidak berkesan terhadap kedua-dua OPF dan NF. Walaubagaimanapun, 30% molases meningkatkan asid laktik NF daripada 14.2 kepada 50.4g/kg DM serta merendahkan pH daripada 4.7 ke 4.0 pada hari ke 30.

Kajian penghadaman *in situ* bebiri menunjukkan potensi degradibiliti kedua-dua OPF yang tidak di rawat dan di rawat dengan molases adalah lebih tinggi ($P<0.01$) berbanding NF. Kepekatan ammonia nitrogen rumen bebiri yang di beri silaj OPF adalah juga lebih tinggi berbanding bebiri yang di beri NF.

Dalam kajian pemakanan yang dijalankan selama 63 hari, anak bebiri yang diberi NF yang di rawat dengan molases menunjukkan peningkatan pengambilan makanan dan LWG yang signifikan ($P<0.01$). Keputusan yang sama juga diperolehi pada anak bebiri yang diberi silaj OPF yang di rawat dengan molases di mana terdapatnya peningkatan pengambilan makanan dan LWG.

Persamaan regresi untuk menunjukkan kaitan antara potensi degradibiliti (a + b) dan pengambilan makanan (VFI) g/kg $W^{0.75}$ ialah $0.50 (a + b) + 51.5$ ($r^2 = 0.5$).

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