



UNIVERSITI PUTRA MALAYSIA

**USE OF FARMYARD MANURE ON MIXED PASTURE OF GUINE
GRASS (*PANICUM MAXIMUM*) AND STYLO (*STYLO GUIANENSIS*)**

AHMED SEID ALI.

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By

AHMED SEID ALI

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

June 2004



Dedication

This Thesis is dedicated to:

My beloved parent

Khedija Ibrahim

and

Seid Ali Ibrahim

For their true love

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

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Chairman: Associate Professor Mohd. Ridzwan Abd. Halim, Ph.D.

Faculty: Agriculture

A field experiment was carried out to investigate the contribution of farmyard manure (FYM) in sustaining productivity and quality of Guinea-Stylo pasture under tin-mine slightly acidic soil at the Faculty of Agriculture research site, Universiti Putra Malaysia (UPM). The aim of this study was to evaluate the effect of rates of FYM on the physiology, dry matter (DM) yield, nutrient quality, and some soil physico-chemical properties in Guinea (*Panicum maximum* cv. Green panic) and Stylo (*Stylosanthes guianensis* cv. Pauciflora) mixed pasture. Six levels of FYM (0 (control), 10, 20, 30, 40, 50 t FYM/ha), and inorganic fertilizer (50 kg P and 50 kg K/ha), were evaluated in a randomized complete block design with four replications. Guinea was transplanted from rootstocks, while Stylo seeds were sown between rows of Guinea grass at a seeding rate of 2 kg/ha.



Four cuttings were taken at 5 weeks interval and compared for plant height, leaf: stem ratio (LSR) and DM yield. The first and the fourth cuttings were compared for plant height, photosynthetic rate (PR), leaf area index (LAI), stomatal conductance (SC), biomass yield, LSR, crude protein (CP), neutral detergent fiber (NDF) and acid detergent fiber (ADF) contents of both species. Beside plant analysis, some soil physical and chemical properties were measured at the first and the fourth cuttings.

Application of FYM up to the rate of 50 t/ha resulted significantly in higher vegetative growth of Guinea and increased rates of physiological processes compared to the control during the first and from that of inorganic fertilizer during the fourth cut. There was a significant increase in plant height, DM, CP, PR, LAI and SC of Guinea grass with increasing rates of FYM applied. On the other hand, the DM yields and stomatal conductance of Stylo declined with increasing FYM rates of application.

Increasing rates of FYM application significantly reduced the fiber content of both species. There was a significant linear decrease in NDF and ADF content of Guinea grass as well as Stylo with increasing rate of FYM applied. However, there was an increasing trend in fiber content of both species from the first cut to the fourth cut.

In addition to its contribution on fodder productivity and quality, effects of FYM on soil physical and chemical properties were also evaluated. Soil analysis after the first and the fourth cut showed that application of FYM significantly decreased soil bulk density. Application of FYM up to 50 t/ha also improved water retention characteristics,



available water holding capacity, aggregation and aggregate stability of the soil, especially at the depth of 0-15 cm. However, application of inorganic fertilizer did not show a significant improvement in soil physical properties.

Beside the effects of FYM on soil physical properties, its contribution on some soil chemical properties was also evaluated. The pH of manure amended soil was significantly higher than that of the control as well as from soil which received inorganic fertilizer, and the effect persisted up to the fourth cuttings. There was a significant linear increase in soil organic matter, nitrogen, phosphorus, potassium, calcium, and magnesium with increasing rate of FYM applied.

The results of this study indicated that FYM up to 50 t/ha can be applied to improve the fertility of the soil and productivity as well as nutrient quality of Guinea grass-Stylo mixed pasture.

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

PENGGUNAAN BAJA SISA HAIWAN UNTUK PASTURA CAMPURAN RUMPUT GUINEA (*PANICUM MAXIMUM*) BERSAMA STYLO (*STYLO GUIANENSIS*)

Oleh

AHMED SEID ALI

Jun 2004

Pengerusi: Profesor Madya Mohd. Ridzwan Abd. Halim, Ph.D.

Fakulti: Pertanian

Uji kaji telah dilakukan untuk menilai sumbangan baja sisa haiwan (BSH) untuk menampung keluaran dan kualiti pastura Guinea-Stylo pada tanah lombong sedikit asid di Ladang Penyelidikan Fakulti Pertanian, UPM. Tujuan uji kaji ini adalah untuk menilai kesan pelbagai aras BSH terhadap fisiologi, hasil berat kering, kualiti nutrien, dan pelbagai sifat fisik dan kimia Guinea (*Panicum maximum* cv Green panic) dan Stylo (*Stylosanthes guianensis* cv. Pauciflora). Enam aras BSH (0, 10, 20, 30, 40, 50 t/ha) dan 50 kg P dan K/ha diuji menggunakan rekabentuk blok rawak penuh dengan empat replikasi. Guinea ditanam daripada tunggul berakar, sedangkan biji benih Stylo ditanam dengan kadar 2 kg/ha di antara baris Guinea.

Empat pemotongan dilakukan selang 5 minggu dan perbandingan dibuat terhadap tinggi tanaman, nisbah daun: batang (NDB), hasil berat kering (HBK). Pada tuaian pertama

dan keempat kajian dibuat ke atas tinggi pokok, kadar fotosintesis (KF), indeks luas daun (ILD), konduktan stomata (KS), keluaran biomasa, NDB, protein kasar (PK), detergent fiber neutral (DFN) dan detergent fiber asid (DFA) pada kedua spesies. Ciri fizikal dan kimia tanah juga dikaji pada tuaian pertama dan keempat.

Pertumbuhan vegetatif dan proses fisiologikal Guinea meningkat secara nyata dengan aplikasi sehingga 50 t/ha BSH. Ciri-ciri seperti ketinggian pokok, HBK, PK, KF, ILD dan KS dari Guinea diperolehi meningkat dengan penambahan BSH berbanding kawalan pada tuaian pertama dan keempat. Sebaliknya aplikasi BSH menurunkan HBK dan KS daripada Stylo.

Peningkatan aras aplikasi BSH menurunkan secara nyata kandungan fiber untuk kedua spesies. Kandungan DFN dan DFA menurun secara linear dengan penambahan BSH dan kandungan fiber pada tuaian keempat melebihi pada tuaian pertama.

Selain kesan terhadap produktiviti dan kualiti makanan ternakan, kesan BSH pada sifat fizikal dan kimia tanah juga dikaji. Selepas tuaian pertama dan keempat didapati ketumpatan pukal tanah menurun secara bererti. Aplikasi sehingga 50 t/ha BSH juga meningkatkan ciri penyimpanan air, kapasiti menahan air, dan agregasi tanah pada kedalaman 0 – 15 cm.

Selain kesan BSH terhadap sifat fizik tanah, kesan terhadap sifat kimia tanah juga dikaji. Aplikasi BSH juga meningkatkan pH tanah dibandingkan kawalan dan tanah yang

diaplikasikan dengan baja inorganik. Kesan ini berterusan hingga tuai keempat. Kandungan bahan organik, nitrogen, fosforus, kalium, kalsium dan magnesium meningkat secara linear dengan peningkatan aras BSH.

Hasil uji kaji ini memberikan kesimpulan bahwa BSH pada kadar sehingga 50 t/ha berupaya untuk meningkatkan hasil, produktiviti dan kualiti nutrien pastura campuran Guinea-Style.

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LIST OF ABBREVIATIONS

The following abbreviations are used in the thesis with or without definition

ADF	Acid detergent fiber
ANOVA	Analysis of variance
AT	Air temperature
AWHC	Available water holding capacity
Ca	Calcium
CEC	Cation exchange capacity
Cl	Chlorine
cmol	Centimol
cm	Centimeter
cm ⁻³	Cubic centimeter
c.v	Cultivars
C	Carbon
CER	Carbon dioxide exchange rate
Co	Cobalt
CP	Crude protein
Cu	Copper
CV	Coefficient of variation
DM	Dry matter
DMD	Dry matter digestibility
DMP	Dry matter Percentage
FAO	Food and Agriculture Organization of United Nation

Fe	Iron
FYM	Farmyard manure
g	Gram
ha	Hectare
ILRI	International Livestock Research Institute
K	Potassium
Kg	Kilogram
kpa	Kilo Pascal
LAI	Leaf area index
LGR	Legume: grass ratio
l.s.d.	List significant difference
L	Liter
LSR	leaf: stem ratio
m	meter
MARDI	Malaysian Agricultural Research and Development Institute
ml	Milliliter
mm	Millimeter
mg	Milligram
Mpa	Mega Pascal
MWD	Mean weight diameter
MWD _d	Mean weight diameter dry
MWD _w	Mean weight diameter wet
Mg	Magnesium