EFFECTS OF SHEEP MANURE APPLICATION ON THE PRODUCTION OF DWARF NAPIER GRASS (*PENNISETUM PURPUREUM* CV. MOTT)

By

SHOKRI BIN JUSOH

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

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DEDICATION

This Thesis is dedicated to:

My beloved parents, sisters and family for their true love and encouragement

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

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Chairman: **Associate Professor Mohd Ridzwan Abd Halim, PhD**

Faculty: **Agriculture**

Studies were conducted to evaluate the utilization of sheep manure as fertilizer for growing Dwarf Napier grass (*Pennisetum purpureum cv*. Mott). The grass received one of six maintenance N fertilizer treatments namely: 1) control, 2) 200 kg N ha^{-1} from urea, 3) 200 kg N ha^{-1} from sheep manure, 4) 100 kg N ha^{-1} from sheep manure, 5) 50-50 mixture of sheep manure and urea at the rate of 200 kg N ha^{-1} and 6) a 50-50 mixture of sheep manure and urea of 100 kg N ha^{-1}. Urea was applied in 4 split applications per year while sheep manure was applied once over a 12 month period.

The effect of types of fertilizer used on the growth performance and nutritional quality of the grass were evaluated in study 1. The organic fertilizer as either sheep manure alone or as combination with urea gave better growth performance of the grass in terms of tiller height, tiller number and leaf area index over 6 cycles of 6 weeks per cycle. The treatment with 200 kg N ha^{-1} of sheep manure gave highest dry matter yield (16 t ha^{-1} yr^{-1}) compared to control (10 t ha^{-1} yr^{-1}). The leaf: stem ratio of the grass shows that the leaf fraction increased significantly over time. The urea fertilizer gave higher crude protein (13%) compared to 12% in other treatments. Grass fertilized with mixed fertilizer gave

higher NDF (73.21%), ADF (40%) and sheep manure gave higher ash concentration (>10%) and low ADL concentration (<0.25%).

Study 2 was conducted to assess the effects of different fertilization regime on the soil chemical properties. The soil fertilized with sheep manure and urea were not significantly difference over a 12-month period. The sheep manure also sustained the plant nutrient in the soil, which was indicated by stabilised soil organic matter and cation exchange capacity over six month. The overall availability of macronutrients in the soil was increased in the soil fertilized with sheep manure compared to control and urea treatments.

The influence of the types of fertilizer used on the ensiled product of the grass was determined in Study 3. The urea fertilized silage gave highest concentration of acetic acid (87.5 mm/L) while the silage with sheep manure as fertilizer gave higher concentration butyric acid (110.3 mm/L) and it contributed to the aerobic stability of the silage. When these plants were later used in animal feeding trial, the intake of silage by lambs was higher for grass silage fertilized with urea and control (800 g day^{-1}) than other treatments. However, the grass silage under organic fertilizer, either as sheep manure only or a mixture of sheep manure provided better digestibility (>60%). The average daily gain of the lambs fed grass silage show that the fertilized grass, i.e.: sheep manure and urea (130 g day^{-1}) was higher compared to control (<50 g day^{-1}). The treatments with sheep manure and mixed fertilizer did not show any differences in terms of animal performance.

In conclusion, the organic fertilizer, either as sheep manure alone or in combination with urea can be used to fertilize pasture grass because it was found relatively better as compared to urea fertilizer alone. This is because it gave a good balance between yield and nutritive quality.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia dalam memenuhi keperluan penganugerahan ijazah Master Sains.

KESAN APLIKASI TINJA BIRI-BIRI KE ATAS PRODUKSI RUMPUT NAPIER KERDIL (*Pennisetum purpureum* cv Mott)

Oeh:

SHOKRI BIN JUSOH

Disember 2005

Pengerusi: **Profesor Madya Mohd Ridzwan Abdul Halim, PhD**

Fakulti: **Pertanian**

Satu kajian di ladang telah dijalankan untuk menilai penggunaan tinja biri-biri sebagai baja untuk menanam rumput Napier Kerdil (*Pennisetum purpureum* cv. Mott). Rumput menerima salah satu dari enam rawatan baja sengaraan N iaitu: 1) kawalan, 2) 200 kg N ha^{-1} dari urea, 3) 200 kg N ha^{-1} dari tinja biri-biri, 4) 100 kg N ha^{-1} dari tinja biri-biri, 5) campuran 50-50 tinja biri-biri dan urea pada kadar 200 kg N ha^{-1} dan 6) campuran 50-50 tinja biri-biri dan urea pada kadar 100 kg N ha^{-1}. Urea diberikan dalam 4 pecahan aplikasi setahun manakala tinja biri-biri diberikan sekali sahaja dalam jangkamasa 12 bulan.

Kesan jenis baja yang digunakan ke atas prestasi tumbesaran dan kualiti pemakanan rumput telah dinilai dalam kajian 1. Baja organik sama ada tinja biri-biri sahaja atau sebagai kombinasi dengan urea menunjukkan prestasi tumbesaran yang lebih baik dari segi tinggi tiler, bilangan tiler dan indeks kawasan daun sepanjang enam pusingan dengan 6 minggu sepusingan. Rawatan dengan 200 kg N ha^{-1} tinja biri-biri memberikan hasil berat kering tertinggi (16 t ha^{-1} $tahun^{-1}$) berbanding dengan kawalan (10 t ha^{-1} $tahun^{-1}$).

Nisbah daun: batang rumput menunjukkan fraksi daun telah meningkat dengan bererti mengikut masa. Baja urea memberikan konsentrasi protein kasar lebih tinggi (13%) berbanding 12% dalam rawatan lain. Rumput yang dibaja dengan baja campuran memberikan konsentrasi NDF (73.21%), ADF (40%) dan tinja biri-biri memberikan konsentrasi abu (>10%) yang lebih tinggi dan konsentrasi ADL (<0.25%) yang lebih rendah.

Kajian 2 telah dijalankan untuk menilai kesan pembajaan ke atas sifat-sifat kimia tanah. pH tanah yang dibaja dengan tinja biri-biri dan urea tidak berbeza dengan bererti dalam jangkamasa 12 bulan. Bahan tinja biri-biri juga mengekalkan nutrien tumbuhan dalam tanah, berdasarkan kestabilan bahan organik tanah dan keupayaan pemegangan kation dalam jangkamasa enam bulan. Kedapatan keseluruhan nutrien makro dalam tanah telah meningkat dalam tanah yang dibaja dengan tinja biri-biri berbanding rawatan kawalan dan urea.

Pengaruh jenis baja yang digunakan ke atas produk rumput peram telah ditentukan dalam kajian 3. Silaj dari rawatan urea memberikan konsentrasi asid asetik tertinggi (87.5 mm/L) manakala silaj dengan tinja biri-biri sebagai baja memberikan konsentrasi asid butirik tertinggi (110.3 mm/L) dan ianya menyumbang kepada kestabilan aerobik silaj. Apabila tumbuhan kemudiannya digunakan dalam ujian pemberian makanan, pengambilan silaj oleh anak biri-biri menunjukkan silaj rumput yang dibaja dengan urea dan kawalan memberikan pengambilan lebih tinggi (800 g $hari^{-1}$) berbanding rawatan lain. Walau bagainmanapun, silaj rumput di bawah baja organik, sama ada tinja biri-biri sahaja atau baja campuran memberikan pencernaan lebih baik (>60%). Purata kenaikan berat badan anak biri-biri diberi makan silaj rumput menunjukkan bahawa rumput dibaja iaitu tinja biri-biri dan urea (130 g $hari^{-1}$) adalah lebih tinggi berbanding kawalan (<50 g $hari^{-1}$). Rawatan dengan tinja biri-biri dan baja campuran tidak menunjukkan sebarang perbezaaan dari segi prestasi haiwan.

Sebagai kesimpulan, baja organik sama ada sebagai tinja biri-biri sahaja atau dengan kombinasi dengan urea boleh digunakan untuk membaja rumput pastura kerana didapati

secara bandingannya lebih baik berbanding dengan baja urea sahaja. Ini adalah kerana ia memberikan keseimbangan yang baik antara hasil dan kualiti pemakanan.

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I certify that an Examination Committee has met on 28th December 2005 to conduct the final examination of Shokri bin Jusoh on his Master of Science thesis entitled Effects of sheep manure application on the production of Dwarf Napier grass **(*Pennisetum purpureum*** cv. Mott) in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and 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:

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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 Science. The members of the Supervisory Committee are as follows:

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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.

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SHOKRI BIN JUSOH

Date: 20 APRIL 2006

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