UNIVERSITI PUTRA MALAYSIA

CHANGES IN NUTRITIVE QUALITY OF *Pennisetum purpureum* var. Red Napier WITH MATURITY

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BY

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A project report submitted to Faculty of Agriculture, Universiti Putra Malaysia, in fulfillment of requirement of PRT 4999 (Final Year Project) for the award of the degree of Bachelor of Agricultural Science

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CERTIFICATION

This project report entitled the "Monitoring Changes in Nutritive Quality of *Pennisetum Purpureum* var. Red Napier with Maturity" is prepared by Nik Zuraila Binti Nik Hassan and submitted to the Faculty of Agriculture in fulfillment of the requirement of PRT 4999 (Final Year Project) for the award of degree of Bachelor of Agricultural Science.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
RCBD	Randomized Complete Block Design
˚C	Degree Celsius
DF	Degree of Freedom
m	meter
m^2	Meter square
mm	Millimeter
cm	Centimeter
l	litre
ml	milliliter
R^2	R-square
SAS	Statistical Analysis System
Tukey's HSD	(Honest Significant Difference)
g	Gram
kg	Kilogram
ha	hectare
kg/ha	Kilogram/hectare
(%)	Percentage

ABSTRACT

The nutritive quality of pasture is important in order to satisfy the nutrient requirements of animals fed on the pasture. The study was conducted to evaluate changes in nutritive quality of Red Napier with maturity. The nutritive quality measurement included Crude Protein (CP), Neutral Detergent Fibre (NDF), Acid Detergent Fibre (ADF) and the morphological measurement included plant height (PH), moisture content (MC), number of tillers (NOT), Leaf to Stem Ratio (LSR) and dry matter yield (DMY). This experiment used the Randomized Complete Block Design (RCBD) with four replications. The treatments were 3, 5 and 7 weeks harvest intervals. Harvest intervals of 3 week gave the highest CP and cumulative dry matter yield (DMY) compared to harvest intervals at 5 week and 7 week. The 3 week cutting interval gave the lowest NDF and ADF. Cutting at 7 week interval gave the lowest dry matter yield. The harvest interval recommended for Red Napier is 3 week because grass cut at this interval had high nutritive quality as well as high dry matter yield.

Another objective of the study was to evaluate whether Near Infrared Spectroscopy (NIRS) can be used to estimate nutritive quality of pastures. The analysis of of CP, NDF and ADF was conducted using conventional laboratory methods and the results were compared with that obtained using NIRS. It was found that there was no correlation between the results obtained from the two methods and the NIRS was not a reliable method to be used in this study. The inability to use NIRS in this experiment was due to improper calibration where samples of forage from a previous study were used to

calibrate the equipment. The calibration with current sample was not done due to some error in the software. To get accurate result, a new calibration should be done with the current samples. This indicates the importance of using the correct samples for calibration if NIRS is to be effectively used.

ABSTRAK

Kualiti pemakanan rumput pastura adalah penting untuk memenuhi keperluan nutrien makanan yang diberi kepada haiwan. Kajian ini dijalankan untuk menilai perubahan dalam nilai pemakanan Red Napier dengan kematang. Pengukuran nilai pemakanan adalah termasuk protein kasar (CP), kandungan serat (NDF), kandungan bahan tidak cerna (ADF) dan pengukuran morfologi termasuk ketinggian tumbuhan (PH), kandungan kelembapan (MC), bilangan anak pokok (NOT), nisbah daun dengan batang (LSR) dan hasil bahan kering (DMY). Eksperimen ini menggunakan reka bentuk blok rawak lengkap (RCBD) dengan empat replikasi. Rawatan yang digunakan adalah 3, 5 dan 7 selang minggu tuaian. Selang tuaian 3 minggu memberikan CP dan berat bahan kering terkumpul (DMY) tertinggi berbanding selang tuaian pada 5 minggu dan 7 minggu. Selang memotong 3 minggu memberikan NDF dan ADF yang paling rendah. Keratan pada 7 minggu selang tuaian memberikan hasil bahan kering yang paling rendah. Selang tuaian disyorkan untuk Red Napier adalah 3 minggu kerana potong rumput di selang ini mempunyai nilai pemakanan yang tinggi dan hasil bahan kering yang tinggi.

Satu lagi objektif kajian ini adalah untuk menilai sama ada Near Infrared Spektroskopi (NIRS) boleh digunakan untuk menganggar nilai pemakanan rumput pastura. Analisis CP, NDF dan ADF telah dijalankan menggunakan kaedah makmal konvensional dan keputusannya dibanding dengan keputusan yang diperolehi dengan menggunakan NIRS. Ia telah mendapati bahawa tidak ada hubungkait antara keputusan yang diperolehi daripada kedua-dua kaedah dan NIRS bukan kaedah yang boleh

dipercayai untuk digunakan dalam kajian ini. Ketidakmampuan untuk menggunakan NIRS dalam eksperimen ini adalah disebabkan oleh kalibrasi yang tidak betul di mana sampel makanan ternakan daripada kajian sebelumnya telah digunakan untuk kalibrasi peralatan. kalibrasi dengan sampel semasa tidak dilakukan kerana beberapa kesilapan dalam perisian. Untuk mendapatkan hasil yang tepat, kalibrasi baru perlu dilakukan dengan sampel semasa. Ini menunjukkan kepentingan menggunakan sampel yang betul untuk kalibrasi jika mahu NIRS digunakan dengan berkesan.

CHAPTER 1

INTRODUCTION

Livestock industry in Malaysia is an important sector in agricultural development in the country after rice industry as a source of protein. This industry includes cattle and goat for production of meat and milk where pasture is used as a main source of feed to livestock. To produce high quality of meat and milk there is a need to prepare good quality forage for livestock. An example of pasture grass species is Red Napier which is native to Africa.

According to George and Bell (2001) the quality of pasture was determined by nutritive value which is influenced by plant maturity. Several factors that affect nutritional quality of pasture species include harvesting date, type of soil, climate, temperature and fertilization. Three measurements of nutritive quality in pasture include Crude Protein (CP), Acid Detergent Fibre (ADF) and Neutral Detergent Fibre (NDF).

Kilcher (1981) showed that there is a relationship between nutritive quality and stage of maturity. Harvesting pastures at a young stage will give forage with high CP while the fibre (NDF and ADF) content is low. However cutting at short intervals will give lower total yield.

Commonly, analysis of CP, NDF and ADF are done by chemical methods which can be time consuming and laborious. To overcome this, there are now more rapid methods for analysis of CP, NDF and ADF such as the use of near-infrared reflectance spectroscopy (NIRS). This technology was discovered by William Herschel, (19th Century) and are commonly used in medical diagnostic, food and agrochemical quality control, combustion research, ergonomic, neonatal research, urology, neurology, rehabilitation, sport medicine and science, elite sport training and brain computer interface. The first application of NIRS was developed by Norris and his colleagues to measure water in seed and grain (Dryden, 2003). The technology of NIRS is simple to use for samples that have been ground and dried. NIRS machine just takes a few seconds to scan a sample for any given components that have been calibrated (Dryden, 2003).

The objectives of the experiment are:

i. to determine changes in nutritive quality of the grass cut at three harvest intervals 3, 5 and 7 weeks.
ii. to compare the method of nutritive quality measurement using conventional laboratory methods with the use of NIRS.

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