UNIVERSITI PUTRA MALAYSIA

COMPARATIVE EVALUATION VIA *IN VITRO* ANALYSIS OF DIFFERENT INOCULANT ON SILAGE MAKING

NIK NUR ANIS SYUHADA AHMAD WARI

FP 2017 105

COMPARATIVE EVALUATION VIA *IN VITRO* ANALYSIS OF DIFFERENT INOCULANT ON SILAGE MAKING

BY

NIK NUR ANIS SYUHADA BINTI AHMAD WARI

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

Faculty of Agriculture

Universiti Putra Malaysia

2016/2017

CERTIFICATION

This project report entitled Comparative Evaluation Via *In Vitro* Analysis Of Different Inoculant on Silage Making is prepared by Nik Nur Anis Syuhada Binti Ahmad Wari and submitted to the Faculty of Agriculture in fulfilment of the requirement of SHW 4999 (Final Year Project) for the award of the degree of Bachelor of Agriculture (Animal Science).

Student's name: Student's signature:

Nik Nur Anis Syuhada Binti Ahmad Wari ……

Certified by:

…….

(Supervisor's signature)

Dr Iswan Budy Bin Hj Suyub

Department of Animal Sciences

Date: ……..

ACKNOWLEDGEMENTS

In the Name of Allah, the Beneficent, the Merciful, first prise is to Allah the Almighty, on whom ultimately we depend for sustenance and guidance. Second, my sincere appreciation goes to my supervisor Dr. Iswan Budy bin Hj. Suyub, for kindly providing me the opportunity to work on this project and his guidance, careful reading and constructive comments was valuable. His effort and patience have been highly appreciated.

My appreciation is extended to all staff, master and PhD student from Department of Animal Sciences, Faculty of Agriculture University Putra Malaysia for their invaluable time, advice and assistance to support me in completing my project in these two semesters. I am also indebted to my project member Erfan Haqique and Nabeelah Aniyyah for all helped and support during completing this project. Special thanks, tribute and appreciation to all these their name do not appear here who have contributed to the successful completion of this project.

Finally, my warmest gratitude to my beloved family especially my parents for their encouraged and provided me constant inspiration during the completing this project. Their continuous love, support and understanding have built me into a better person in my life. Thank you very much.

CONTENT

CHAPTER 3

METHOD AND MATERIAL

CHAPTER 4

RESULT

LIST OF TABLE AND FIGURE

LIST OF ABBREVIATIONS

ADF	Acid Detergent Fiber
ADL	Acid Detergent Lignin
ANOVA	Analysis Of Variance
cm	Centimetre
CO_2	Carbon Dioxide
CP	Crude Protein
EM	Effective Microorganism
g	Gram
IVDMD	*In Vitro* Dry Matter Digestibility
L	Litre
ml	Millilitre
NDF	Neutral Detergent Fiber
OM	Organic Matter
pH	Measure Of Acidity
°C	Degree Celsius
%	Percentage

ABSTRACT

Ensilaging forage into silage is a method to improve the feed quality in term of digestibility. Ensilaging process are compressing and fermenting fodder crops under anaerobic condition. Inoculants were added into silage to increase the digestibility of the fodder. In this study, the different inoculant of effective microorganism and rumen fluid are used to determine the digestibility by using *in vitro* analysis. The three treatments with six replicated for each silage has being made. Silage was made using 6 weeks Napier grass that has being chopping for 3 cm average. Silage without inoculant was the control treatment. Treatment 2 was used Effective microorganism as the inoculant and treatment three are used rumen fluid as inoculant. All silages are fermented for 21 day in the seal plastic bags.

In vitro gas production was measure every four hours for 72 hours. The gas production result showed significant difference ($P<0.05$) between control silage and inoculated silage. But, there are no significant difference ($P<0.05$) between two inoculated silage. The same results are show for the chemical analysis of organic matter (OM), neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL).

ABSTRAK

Pensilajan makanan ternakan kepada silaj adalah salah satu kaedah untuk meningkatkan kualiti makanan terutamanya untuk proses penghadaman. Proses pensilajan dilakukan mengunakan kaedah memampatkan dan penapaian di dalam keadaan anaerobik. Menambah inokulan ke dalam silaj adalah untuk meningkatkan kadar penghadaman sesuatu makanan. Dalam kajian ini, inokulan yang berbeza digunakan iaitu mikroorganisma berkesan (EM) dan kandungan rumen digunakan untuk menentukan penghadaman dengan menggunakan analisis *in vitro*. Tiga ujian dengan enam replika untuk setiap silaj telah dibuat. Silaj dibuat menggunakan rumput Napier yang berusia enam minggu dan di potong sepanjang 3 cm. Silaj tanpa inokulan adalah ujian kawalan. Ujian 2 menggunakan EM sebagai inokulan dan ujian 3 adalah menggunakan kandungan rumen sebagai inokulan. Semua silaj diperam selama 21 hari dalam beg plastik meterai .

Pengeluaran gas *in vitro* di ukur setiap empat jam sehingga 72 jam. Hasil pengeluaran gas menunjukkan terdapat perbezaan yang signifikan ($P < 0.05$) antara silaj kawalan dan silaj berinocukum. Namun tidak ada perbezaan yang signifikan ($P < 0.05$) antara dua silaj inokulum. Hasil keputusan yang sama diperolehi untuk analisis kimia, bahan organik (OM), pelarut neutral serat (NDF), pelarut serat asid (ADF) dan pelarut asid lignin (ADL). Tiada perubahan untuk bahan kering (DM) dan protein kasar (CP) ini menunjukan penghasilan silaj mampu melindungi rumput dari kehilangan nutrient**.**

CHAPTER 1

INTRODUCTION

Feed play the important role in livestock industry, but low quality and quantity of feed become a major constraint that limits livestock productivity among the smallholder famer (Ayantunde, 2005). Feeding itself covers up to 70% from the total operating cost of ruminant production. Improvement of the feed quality is very important to achieve better livestock production.

Ensilaging forage into silage is one of the methods to improve the feed quality in term of digestibility. Silage is a fodder prepared by compressing and fermenting green forage crops under anaerobic conditions. The purpose of making silage depends on the farming condition, whether to have continuous supply of animal feed, systematic feed management or additional income as feed producer. Furthermore, silage is more palatable and also more digestible compare to fresh content.

Ensilaging is the fermentation proses of forage that involve interaction of forage, microbial population and ensiling that held in the anaerobic biochemical process. The successful of silage making is based on the promotion of the fermentation brought by beneficial bacteria (Jatkauskas and Vrotniakien 2006). Many type of silage have being made from many kind or variety of crop. However, green forage is ideal for silage because it has high sugar and low protein content that will promote good fermentation. Elephant grass (*Pennisetum purpureum*) is a forage grass that have reasonable amount of soluble carbohydrates and have high dry matter. However, the high moisture content when it in a state of high nutritive value

is an obstacle for silage making, because it will results an undesirable fermentation with considerable nutrient losses (Zanine *et al*. 2007).

To overcome the problem highlighted, adding inoculant in silage will enhance the fermentation process of silage and also improve fermentation and digestibility. Ensilaging forage with microbial inoculants improve the feed quality (Kassu, *et al*., 2014). Silage inoculants are additives containing anaerobic lactic acid bacteria (LAB) that are used to manipulate and enhance fermentation in silage (Muck, 1996). Microbial of lactic acid bacteria are used as silage inoculants (Contreras-Govea *et al*. 2011). Indirectly, microbial inoculants not only affect plant fermentation but also animal performance as an additional source of microbial protein (Kung *et al*.2003). On top of digestibility improvement (Guim and Ruggieri, 1999), inoculated silage can reduce the pH and ammonia formation and promoted lactic acid production (Muck and Kung 1997).

Objective

General objective of this study is to compare the digestibility of silage with different inoculant.

Specific objective is:

1. To compare the differences of *in vitro* gas production between silage treat with Effective Microorganism and rumen fluid.
2. To compare the *in vitro* dry matter digestibility (IVDMD) between silage treated with EM and rumen fluid.

REFERENCES

A, Ayantunde, A. A., Fernandez-Revera, S., and McCrabb. G. (2005) Coping With Feed Scarcity in Smallholder Livestock System in Developing Countries.

Annison, E. F. & W. L. Bryden.(1998). Perspectives on Ruminant Nutrition and Metabolism. Nutrition Research Reviews 11:173-198

Barrios, Edmundo.(2004) "The *in vitro* dry matter digestibility (IVDMD) method." Modelling Nutrient Management in Tropical Cropping Systems 114: 62

Contreras-Govea, F. E., Muck, R. E., Mertens, D. R., & Weimer, P. J. (2011). Microbial Inoculant Effects on Silage And *In Vitro* Ruminal Fermentation, And Microbial Biomass Estimation for Alfalfa, Bmr Corn, And Corn Silages, 163(1), 2–10.

Feed Innovation Services (FIS) (2003).The Effects of Grass Silage Treated with Em Silage on Methane and Volatile Fatty Acid Production in the Rumen

Ferreira, D. de J., Lana, R. de P., Zanine, A. de M., Santos, E. M., Veloso, C. M., & Ribeiro, G. A. (2013). Silage Fermentation and Chemical Composition of Elephant Grass Inoculated With Rumen Strains of Streptococcus Bovis, 183(1-2), 22–28

Filya, I., Muck, R.E., Contreras-Govea, F.E., (2007). Inoculant Effects on Alfalfa Silage: Fermentation Products and Nutritive Value. J. Dairy Sci. 90, 5108–5114.

Guim, A., & Ruggieri, A. (1999). Effect of EM on the Consumption, Nutritive Value and Digestibility of Elephant Grass Silage by Ruminant Animals, 100, 1–3.

Hungate, R. E. (1975). The Rumen Microbial Ecosystem. 6: 39-66

Jatkauskas, J., & Vrotniakien, V. (2006). Effects of Silage Fermentation Quality on Ruminal Fluid Parameters, 4, 65–71

Kassu, Y., & Demeke, S. (2014). Effect of Effective Microorganism (EM) On The Nutritive Quality Of Coffee Husk Silage, International Journal Of Scientific & Technology Research 3(7).

Kentucky Veterinary Medical Association. (2004). Rumen Fluid Analysis.

Kung Jr., L., Stokes, M.R., Lin, C.J., (2003). Silage Additives, In: Buxton, D.R.,

Menke, K. H., Raab, I., Salawski, A., Steingass, H., Fritz., D., And Schneider, W. (1979).The Estimation of The Digestibility and Metabolizable Energy Content of Ruminant Feedingstuffs From The Gas Production When They Are Incubated With Rumen Liquour *In Vitro*. The Journal of Agriculture Science, 93(01), 217-222

Moran, J., (2011). Improving the utilisation of Napier grass by dairy cows through fractionating the stems into juice and fibrous residue. In: Successes and failures with animal nutrition practices and technologies in developing countries, FAO Anim. Prod. and Health Proceedings, 11: 97-100

Muck, R.E., Harrison, J.H. (Eds), Silage Science and Technology. Agron. Monogr. 42. ASA, CSSA, and SSSA, Madison, WI, USA, pp. 305–360.

Prescott, L. M., J. P. Harley & D. A. Klein.(2005). Microbiology. Sixth Edition. New York: McGraw-Hill.

Rymer, C., Huntington, J. A., Williams, B. A., Givens, D. I., & Tf, N. (2005). In Vitro Cumulative Gas Production Techniques: History, Methodological Considerations and Challenges, 124, 9–30.

S. J. Mabjeesh, M. Cohen, A. Arieli, (2000). *In Vitro* Methods for Measuring the Dry Matter Digestibility of Ruminant Feedstuffs: Comparison of Methods and Inoculum Source, Journal of Dairy Science Vol. 83, No. 10

Weinberg, Z.G., Muck, R.E., (1996). New Trends in Development and Use of Inoculants for Silage. 19, 53–68.

Zanine, A.M., Santos, E.M., Ferreira, D.J., Pinto, L.F.B., Pereira, O.G., (2007), Fermentative Characteristics and Chemical Composition of Elephant Grass Silages With or Without Lactobacillus Plantarum and Wheat Meal Isolated or in Association, Ciênc. Anim. Bras. 08, 609–620.