A Study on the Utilization of the Bioresources in Thalae–Noi Basin as Animal Feed: 2 Chemical Compositions and Ruminal Dry Matter Degradation Parameters of the Bioresources in Thalae–Noi Basin Ensiled with Corn Stover at Different Levels

Ong-arge Insung[1] and Aporn Songsang[2]
[1]Rajamangala University of Technology Srivijaya, Thailand
[2]Thaksin University, Thailand

ABSTRACT

Two consecutive experiments were undertaken to evaluate the chemical compositions and the ruminal dry matter degradation parameters of the bioresources in Thalae–Noi basin ensiled with corn stover at different levels. Three prominent bioresources in Thalae–Noi basin, Wide-leafed water grass (*Hanguana malayana* (Jack) Merr.), Thin Napier grass (*Pennisetum polystachyon (L.)* Schult.) and Water hyacinth (*Eichornia crassipes* (Mart.) Solms which have good chemical composition and availability derived from the previous experiment were selected for ensilage with corn stover at 0 25 50 75 and 100% levels of each plant species. In the first experiment, the physical properties and the chemical compositions of all ensiled products were used for determination of the physical properties and chemical compositions. The second experiment deal with the evaluation of the ruminal dry matter degradation parameters of the dried ensiled products using the nylon bag technique. The collected data from the experiment were subjected to analyze using the model fit for the randomized complete block design (RCBD). It was found that all plant species ensiled with corn stover at different levels provided a good silage quality in both the color (green brown and green yellow) and the smell (lactic acid odor). The pH ranged from 4.01- 4.92 which is classified as the acceptable pH for good quality silage. Ensiled Water hyacinth at 100% level provided the highest ($P<0.01$) potential degradability (PTDG). The Wide-leafed water grass provided the ensiled product with the highest ($P<0.01$) the water soluble fraction ('a' value), whereas the Thin Napier grass at 100% level provided the highest the non- water soluble but potentially fermentable in the rumen at the time 't' fraction ('b' value). These research results implied that the bioresources in Thalae–Noi basin especially the Wide-leafed water grass, Thin Napier grass and Water hyacinth had been proven that they were essential feed resources for use as ruminant feed. Using of the bio resources in Thalae–Noi basin for the ruminants feed both as fresh and preserved form by silage making is the practical solution way to relieve the scarcity of roughage during the shortage period on the dry season in the south of Thailand.

Key Words: Bioresources, Thalae–Noi Basin, Ruminal Dry Matter Degradation Parameters, Preserved forage, Ensilage

INTRODUCTION

The Thalae–Noi is one of the most attractive tourist destination places in the south of Thailand. Thalae–Noi basin is a wetland area consisting of diverse species of plant that can be use for many purposes. For the animal nutritionist point of view, the bioresources in Thalae-Noi might be use as animal feed. The objective of this study was to determine the chemical compositions and the availability of the bioresources in Thalae–Noi basin for use as

[1] The correspondence author. Department of Animal Science, Faculty of Agriculture, Rajamangala University of Technology Srivijaya, Nakhonsithammarat at Sai-Yai Campus, Thungsong district Nakhonsithammarat 80110

animal feed. Three prominent bioresources in Thalae–Noi basin, Wide-leafed water grass *(Hanguana malayana (Jack) Merr*.), Thin Napier grass (*Pennisetum polystachyon (L.)* Schult.) and Water hyacinth (*Eichornia crassipes* (Mart.) Solms which have a high potential for use as animal feed were selected for ensilage with corn stover at 0 25 50 75 and 100% levels for determination on the chemical compositions and the ruminal dry matter degradation parameters.

MATERIALS AND METHODS

Trial 1 Ensilage the bioresources with corn stover at different levels and use for chemical composition analysis

Trial 2: Rumen dry matter degradation parameters study

RESULTS AND DISCUSSION

Table1 Physical and chemical properties of plant ensiled with corn stover at different levels

Table1 Physical and chemical properties of plant **ensiled with corn stover at different levels**

Corn :Grass species	**Ratio**	**Fresh weight**	**Dry weight**	**Average pH value**	**color**	**ordor**
All Corn	100	1500	300	4.92	Greenish yellow	lactic acid representing
Corn: Wide-leafed water grass	75:25	1300	305	4.68	greenish brown	lactic acid representing
Corn: Wide-leafed water grass	50:50	1500	260	4.70	greenish brown	lactic acid representing
Corn: Wide-leafed water grass	25:75	1250	242	4.37	greenish brown	lactic acid representing
Corn: Wide-leafed water grass	0:100	1500	227	4.45	greenish brown	lactic acid representing
Corn: Water hyacinth	75:25	1500	300	4.87	greenish brown	lactic acid representing
Corn : Water hyacinth	50:50	1500	220	4.62	greenish brown	lactic acid representing
Corn : Water hyacinth	25:75	1300	245	4.89	greenish brown	lactic acid representing
Corn: Water hyacinth	0:100	1300	175	4.91	greenish brown	lactic acid representing
Corn: Thin Napier grass	75:25	1500	422	4.28	Greenish yellow.	lactic acid representing
Corn: Thin Napier grass	50:50	1075	330	4.01	Greenish yellow.	lactic acid representing
Corn: Thin Napier grass	25:75	1500	383	4.73	Greenish yellow.	lactic acid representing
Corn: Thin Napier grass	0:100	1500	427	4.56	Greenish yellow.	lactic acid representing

Table 2 Chemical compositions of the bioresources in Thalae–Noi basin ensiled with corn stover at different levels (% on DM basis)

Plant species	Ratio	chemical composition								
		Moisture **	Crude protein	Ether exttract	Crude fiber	Crude Ash	Neutral detergent fiber (NDF)	Ligno cellulose (ADF)	Acid detergent Lignin (ADL)	Phosphorus
All Corn	100	10.43	8.94	2.51	33.76	10.27	66.35	40.09	6.01	0.17
Corn: Wide-leafed water grass	75:25	11.41	8.6	2.08	29.85	11.6	62.47	38.35	6.68	0.25
Corn: Wide-leafed water grass	50:50	10.67	8.15	3.92	28.36	13.02	59.70	36.54	7.49	0.23
Corn: Wide-leafed water grass	25:75	12.07	9.57	3.47	29.51	13.24	56.82	37.45	8.11	0.20
Corn: Wide-leafed water grass	0:100	10.5	9.77	3.09	22.54	15.05	50.05	37.98	8.44	0.16
Corn: Water hyacinth	75:25	11.84	9.92	2.67	29.01	11.68	59.03	36.26	4.50	0.23
Corn : Water hyacinth	50:50	11.67	7.69	4.96	28.96	11.64	58.95	34.94	4.20	0.23
Corn : Water hyacinth	25:75	13.44	7.64	1.86	26.96	12.12	57.35	35.10	4.36	0.21
Corn: Water hyacinth	0:100	14.52	6.87	2.47	26.29	13.7	55.85	35.32	4.10	0.16
Corn: Thin Napier grass	75:25	10.03	7.28	1.65	28.58	10.34	66.46	41.01	5.04	0.22
Corn: Thin Napier grass	50:50	11.08	6.68	1.29	28.65	10.07	66.63	37.69	4.66	0.19
Corn: Thin Napier grass	25:75	9.47	6.78	2.30	31.59	10.82	65.66	41.47	5.44	0.16
Corn: Thin Napier grass	0:100	9.26	5.41	2.09	32.23	10.14	68.34	41.89	6.28	0.13

** percent on air dry basis

Plant species	Ratio	Ruminal degradation parameters (%)					
		a	b	c(fraction/h)	ed 2	WL	PTDG
All Corn	100	20.50^{G}	46.04^{BCD}	0.027^{CD}	36.33^{G}	8.42^{M}	66.53^{BCDE}
Corn: Wide-leafed water grass	75:25	26.91^{C}	44.47^{BCD}	0.031^{C}	43.32^{CD}	19.66^{D}	71.38^{ABCD}
Corn: Wide-leafed water grass	50:50	30.14^{B}	43.89^{BCD}	0.024^{CD}	44.15^{C}	19.23^{E}	74.04^{ABC}
Corn: Wide-leafed water grass	25:75	27.33^{C}	38.30^{CD}	0.049^{A}	46.07^{B}	23.62^{B}	65.63^{CDE}
Wide-leafed water grass	100	35.86^{A}	35.25^{D}	0.035^{BC}	49.02^{A}	25.37^{A}	71.11^{ABCD}
Corn: Water hyacinth	75:25	24.73^{FE}	49.56^{ABC}	0.027^{CD}	41.67^{E}	18.58^{F}	74.28^{ABC}
Corn : Water hyacinth	50:50	25.95^{CDE}	48.38^{ABC}	0.025^{CD}	41.58^{E}	16.16^{J}	74.34^{ABC}
Corn : Water hyacinth	25:75	26.53^{CD}	51.66^{AB}	0.025^{CD}	42.68^{DE}	19.76^{C}	78.18^{AB}
Water hyacinth	100	31.13^{B}	51.58^{AB}	0.017^{DE}	44.42^{C}	18.06^{G}	82.71^{A}
Corn: Thin Napier grass	75:25	22.97^{F}	43.35^{BCD}	0.031^{C}	39.28^{F}	17.19^{H}	66.33^{BCDE}
Corn: Thin Napier grass	50:50	24.06^{FE}	38.17^{CD}	0.043^{AB}	41.28^{E}	16.51^{I}	62.23^{DE}
Corn: Thin Napier grass	25:75	19.64^{G}	39.41^{CD}	0.030^{C}	34.38^{H}	13.36^{K}	59.05^{E}
Thin Napier grass	100	19.96^{G}	58.03^{A}	0.012^{E}	30.25^{I}	11.56^{L}	77.99^{AB}
SEM		0.661	3.454	0.003	0.506	0.001	3.56

Degradation constants derived from the Ørskov and McDonald (1979) equation $P= a+b(1 - e^{-ct})$ where P is degradability at time 't'; 'a', the rapidly soluble fraction; 'b', the potentially degradability of dry matter with in time 't', be degraded; 'c', the degradation rate of the 'b' fraction. Effective degradation in the rumen at 0.05 fraction/hr passage rate is represented by 'ed2' and is calculated by using the Excel Application Programs for processing feed degradability data written by Chen (1995); POTDG = Potential degradability (a+b).

$^{A\,B\,C\,D\,E\,F\,G}$ Mean in the same row not having at least a common superscript differ significantly (P<0.01).

CONCLUSIONS

These research results implied that the bioresources in Thalae–Noi basin especially the Wide-leafed water grass, Thin Napier grass and Water hyacinth had been proven that they were essential feed resources for use as ruminant feed. Using of the bio resources in Thalae–Noi basin for the ruminants feed both as fresh and preserved form by silage making is the practical solution way to relieve the scarcity of roughage during the shortage period on the dry season in the south of Thailand.

REFERENCES

Chen, X. B. 1995. Neway an excel application program for processing feed degradability data, User manual, [online available at http://www.macaulay.ac.uk/IFRU/resrc_fcurve.html

Close, W. and K. H. Menke. 1986. Selected topics in animal nutrition. A manual prepared for the 3rd Hohenheim course on animal nutrition in the tropics and Semi-Tropies. 2nd edition. F. u. T. Mülerbarder, Filderstadt, Germany. 170 p.

Goering, H. K. and P. J. Van Soest. 1970. Forage fibre analysis. Agricultural Handbook no. 379. Agricultural Research Service, US Department of Agriculture, Washington, D. C.

Ørskov, E. R. and I. McDonald.1979. The estimation of protein degradability in the rumen from incubation measurements weighted according to the rate of passage. J. Agric. Sci. (Cambridge). 92:499-503.

Steel, R.G.D. and J. H. Torrie. 1981. Principle and Procedures of Statistics A Biometrical Approach 2nd. ed. McGraw-Hill Book Company, Singapore. 633 pp.