Quest Journals
Journal of Research in Agriculture and Animal Science
Volume 8 ~ Issue 1 (2021) pp: 25-28
ISSN(Online) : 2321-9459
www.questjournals.org

Research Paper

The Preservation of Mangrove (*Avicennia Marina*) Leaves through Silage and Hay As Animal Feed

Rani Winardi Wulan Sari[2], Novirman Jamarun[1], Suyitman[1], Khasrad[1], and Gusri Yanti[2]

[1]*Lecturer of Animal Science Faculty of Andalas University, Padang, Indonesia*
[2]*Ph.D Student of Animal Science Faculty, Andalas University, Padang, Indonesia*
Corresponding Author: Novirman Jamarun

ABSTRACT : *Feed is one of the main factors for success of a livestock business because 60-80% of the total production costs are used for feed costs. Main feeds for ruminants are in the form of forages. The feed problems are the limiting quantities of forages. This condition can be overcome by providing alternative feed. The alternative feed that can be used as feed for ruminants are mangroves leaves. Feed processing can be used to extend the preservation of feed ingredients longer and maintain nutritional content. Technology for preserving animal feed can be used as silage or hay. The method used in this research was an experimental method, using a completely randomized design (CRD) for making silage and hay of mangrove leaves with 2 treatments and 5 replications. The treatments are: P1 (Mangrove silage) and P2 (Mangrove hay). The observed variables were physical quality (color, odor, texture, temperature, pH) and nutrient content (dry matter, organic matter, crude protein, and crude fiber). The results of the research showed that preserving treatment of mangrove (Avicennia marina) leaves had significant effect (P> 0.05) on crude fat, but no significantly different on dry matter, organic matter, crude protein, and crude fiber content. The conclusion in this study was the treatment P2 (Mangrove hay) are better than the mangrove silage based on physical characteristics and nutrients composition.*

KEYWORDS: *Mangrove, Preservation, Silage, Hay, Nutrients Content*

Received 05 Jan, 2021; Revised: 18 Jan, 2021; Accepted 20 Jan, 2021
Published with open access at www.questjournals.org

I. INTRODUCTION

Feed is one of the main factors in the success of a livestock business including ruminants because 60-80% of the total production costs are used for feed costs [1]. Ruminant feed consists of forages, concentrates, vitamins and minerals sources. Forages that are commonly used as feed for the people's livestock business in rural areas are field grass and agricultural waste. The problem of feed is the low availability of forages. The solution to solve this condition it is to look for another potential new forages resources to be used as alternative feeds. One of the forages that can be used as feed for livestock that is available in large quantities and is easily to obtained are mangrove. One of the forages that can be used as an alternative feed for ruminants is mangroves. Mangrove trees are a type of tropical mangrove plant from the genus *Avicennia*. *Avicennia marina* contain 69,2% water, 14.91% ash, 2.21% fat and 11.04% protein [2].

Processing is necessary in order to extend the shelf life of feed ingredients longer and maintain nutritional content. The nutrient content was influenced by variety, growing environment and processing methods [3]. Mangrove leaves have not much used as fodder forage, because there was few researches of the utilization of mangrove leaves by farmers especially the preserving treatments, therefore it is necessary to conduct research to determine the nutrient content of mangrove leaves, so that after doing research it can be compared between silage and hay. The results of the research are expected to determine the best preserving treatment of mangrove leaves as ruminant feeds.

II. MATERIALS AND METHODS

The materials used in this study were mangrove leaves (*Avicennia marina*), filter paper, oven, kiln, dessicator, whatman filter paper no.41, beaker, buchner funnel, vacuum pump, Tecator Scrubber, digestion tube, soxhlet extractor tube, and chemicals for nutrients analysis parameters observed. The method used in this research was an experimental method, using a completely randomized design (CRD) for making silage and hay

with 2 treatments and 5 replications that is P1: Mangrove Silage, and P2: Mangrove Hay. and the data was analysed by T test.

Variables Observed on this research was dry matter, organic matter, crude protein, crude fiber, crude fat, and nitrogen free extract (NFE) content mangrove from silage and mangrove hay using AOAC method (1990) [4].

Implementation

Mangrove leaves are taken at coastal areas of Tiram Beach, Padang Pariaman Regency, West Sumatra. Dry matter was measured by drying method using thermogravimetri. Organic matter measured by direct method, crude fat using Soxhlet method, crude protein using micro Kjeldahl, crude fiber using gravimetri method, and nitrogen free extract (NFE) calculated with the formula of Tillman et al. (1998) [5].

III. RESULTS AND DISCUSSION

Physical Characteristic

The physical characteristic of mangrove leaves (*Avicennia marina*) based on treatments of silage and hay was presented in Table 1.

Table 1. Physical characteristics of Mangrove silage and Mangrove hay

Physical characteristic	Treatment	
	P1 (Mangrove Silage)	P2 (mangrove Hay)
Color	Green brownish	Brown dry
Odor	Slightly sour	odorless
Texture	Moist, Stiff, not break easily	Dry, not break easily
Temperature (^{0}C)	27.9	33
pH	5.2	5.5

The effect of preservation methods on the physical quality of silage and hay of mangrove leaves (*Avicennia marina*) is presented in Table 1. It was found that the physical characteristic of mangrove leaf silage had good quality, namely green brownish color, slightly sour aroma, texture (moist, stiff, and not break easily) and the temperature was 27,9℃. The quality of silage can be seen from its physical characteristics [6]. A good silage has a pH between 3,8-4,2 with a fine texture, green brownish color, when it is clenched there is no water and odor, water content is 60-70% and smells good [7]. Good silage texture has toughness and is softer, making it difficult to separate it from the fibers [8]. Generally, good silage has characteristics, namely the texture is still clear, like nature and smells sour [9]. However, at a high of pH it was occur due to the absence of additional sources of soluble carbohydrates to accelerate the fermentation process. The pH category from 3,8 to 4,2 is based on silage made using preservatives. Preservatives are usually added to provide soluble carbohydrates which are useful in fermentation, especially to lower the pH of silage [10].

The effect of preservation methods on hay of mangrove leaf (*Avicennia marina*) is shown in Table 1. It was found that the physical quality of the hay was good. The principle of the process of making hay is to reduce the moisture content to 15-20% in a short time, either with solar heat or artificial heat. The characteristics of a good hay are yellowish green color, not many damaged leaves, the shape of the leaves is still intact or clear and not dirty or moldy, and does not break easily when the stems are folded by hand [11].

Dry Matter, Organic Matter, Crude Protein, Crude Fiber, Crude Fat, And Nitrogen Free Extract (NFE)

The chemical composition of mangrove leaves (*Avicennia marina*) is presented in Table 2. The nutritional value of mangrove leaves (*Avicennia marina*) shows that preserving treatment with silage and hay treatments on mangrove leaves has a very significant effect ($P < 0.05$) on crude fat.

Table 2. Chemical Composition of Mangrove Silage and Mangrove Hay (%).

Nutrients	**P1 (Mangrove silage)**	**P2 (Mangrove hay)**
Dry Matter	38,41b	90,15^a
Organic Matter	89,50^a	90,21^a
Crude Protein	8,13^a	9,96^a
Crude Fat	3,13^b	2,46^a
Crude Fiber	7,64^a	9,48^a
Ash	11,40^a	9,70^a
NFE	61,20^a	61,45^a

Different superscripts in the same row are significantly different (P <0.05).

The nutrient content of mangrove preserved as hay and silage is shown in Table 2. The dry matter of P1 (Mangrove Silage) 38,41% and P2 (Mangrove Hay) 90,15%. In table 1 the dry matter yield in silage is lower

than hay. This is presumably due to a decrease in material dry silage treatment affected by fermentation and respiration. fermentation will produce lactic acid and water. Respiration will cause a lot of nutrient content to be broken down so that it will decrease dry matter [12].

Organic matter of P1 (Silage Mangrove leaf) 89,50% and P2 (Mangrove hay) 90,21%. It is known that the lactic acid in the ensilage is produced from components of organic matter, especially carbohydrates, so that the formation of lactic acid increases. The loss of organic material in silage mainly comes from the carbohydrate group, namely Nitrogen Free Extract (NFE) with the main constituent components of starch and sugar which are used by bacteria to produce lactic acid. Loss of material organic matter is characterized by increasing water content and decreasing silage NNFE content [13].

The crude protein value (CP) content of P1 is 8,13% and P2 9,96%. CP of grass silage was 1.83 units lower than the CP hay value. The CP content in hay is higher than silage according to the research [14], that the PK content in the silage of *Panicum virgatum L.* grass was 14.2% lower than that of grass preserved by the hay method. A decrease in CP on silage treatment can be due to the degradation of CP by protease enzymes derived from forages and proteolytic clostridia during the ensilage process. [15] in forage ensilage both directly and after withering, proteolysis takes place continuously within 24 hours. It is further explained that the initiation of proteolytic activity during the ensilage occurs due to the protease enzyme activity of the forage.

Table 2 shows that the crude fat value content of P1 is 3,13% and P2 2,46%. The higher value of silage than hay because on hay maker using heat treatments. Heating treatments breaking down fat components into volatile products such as aldehydes, ketones, alcohols, acids and hydrocarbons, which greatly affect flavor formation [16].

The crude fiber of P1 7,64% and P2 9,48%. The value of P1 (Silage mangrove leaf) are lower than the value of P2 (Hay Mangrove leaf). It is because the decrease crude fiber on silage is due to changes in crude fiber components of other easily digested carbohydrates (monosaccharides and disaccharides). Besides, it is known that crude fiber content is influenced by several factors, namely storage time, absence of oxygen from silage foodstuffs, plant cell respiration, influence on fermentation, influence on nutritional value, moisture content, plant factors, silage additives and storage [17].

NFE content of P1 is 61,20% and P2 61,45%. The average nutrient content of NFE in P1 is lower than P2, viewed from a nutritional aspect, which is less beneficial because the nutrients in P1 are lower and the components of organic compounds (carbohydrates, proteins and fats) digested and the energy that can be produced is also lower. NFE content of a feed ingredient was depend on their components, such as water, ash, crude protein, crude fiber and crude fat. If the amount of water, ash, crude protein, crude fat and crude fiber is reduced from 100, the difference is called nitrogen-free extract (NFE) [18].

IV. CONCLUSION

The results of the experiment showed that the best preserving treatments for mangrove leaves (*Avicennia marina*) was P2 (Mangrove Hay) based on physical characteristic and nutrients composition in term of organic matter 90,21%, crude protein 9,96%, crude fiber 9,48%, and NFE 61,45%.

V. RECOMMENDATION

Another research needs to be carried out by making complete rations as a feed for ruminant animals based on mangrove leaves (*Avicennia marina*) in *in-vivo* methods.

ACKNOWLEDGMENT

The author would like to gratefully thank to the Ministry of Research, Technology and Higher Education for research funding through PMDSU Scholarship for the year of 2020.

REFERENCES

[1] Siregar, S.B. 2003. Ransum Ternak Ruminansia. Penebar Swadaya. Jakarta.

[2] Handayani, S. 2013. Kandungan Flavonoid Kulit Batang dan Daun Pohon Api-api (*Avicennia marina* (Forks.) Vierh). sebagai Senyawa Aktif Antioksidan. Skripsi. Institut Pertanian Bogor. Bogor.

[3] Tolessa, Egata. 2018. Importance, Nutrient content and Factors Affecting Nutrient Content of Potato. 3. 37-41.

[4] AOAC. 1990. Official Methods of Analysis Food Compotition; Additives; Natural Contaminants. Vol 2. 15th edition. Virginia. USA.

[5] Tillman, A. D., H. Hartadi, S. Reksohadiprodjo, S. Prawirokusumo,L. Lebdosoekojo. 1998; dalam Riswandi *et al*, 2016. Ilmu Makanan Ternak Dasar. Gadjah Mada University Press. Yogyakarta.

[6] Ferreira, Gonzalo, Mertens, and David. 2005. Chemical and Physical Characteristics of Corn Silages and Their Effects on In Vitro Disappearance. Journal of dairy science. 88. 4414-25. 10.3168/jds.S0022-0302(05)73128-3.

[7] Ratnakomala, S., R. Ridwan, G. Kartina, dan Y. Widyastuti. 2006. Pengaruh Inokulum Lactobacillus plantarum 1A-2 dan IBL-2 dalam Pembuatan Silase Rumput Gajah. Jurnal Peternakan, 28(3). Hal 132-133.

[8] Macaulay, A. 2004. Evaluating Silage Quality. Gramedia Pustaka Utama, Jakarta.

[9] Siregar, S.B. 1996. Pengawetan Pakan Ternak, Penebar Swadaya. Jakarta.

[10] Matsuhima, J.K. 1979. Feeding Beef Cattle. Sprenger Verlag, Berlin. Heidelberg.

[11] Subekti, E. 2009. Ketahanan Pakan Ternak Indonesia. Mediagro. 5 (2) : 63-71.
[12] Sartini. 2003. Kecernaan bahan kering dan bahan organik in vitro silase rumput Gajah pada umur potong dan level aditif yang berbeda. J. Pengembangan Peternakan Tropis
[13] Surono. Hadiyanto. A.Y dan M. Christiyanti. 2006. penambahan bioaktivator pada complete feed dengan pakan basal rumput gajah terhadap kecernaan bahan kering dan bahan organik secara in vitro. fakultas peternakan dan pertanian. Universitas Diponegoro. Semarang.
[14] Luginbuhl, J.M., K.R. Pond, J.C. Burns and D.S. Fisher. 2000. Intake and Chewing Behavior of Steers Consuming Switchgrass Preserves as Hay and Silage. J. Anim. Sci. 78:1983–1989.
[15] Givens, D.I. and H. Rulquin. 2004. Utilization by ruminants of nitrogen compounds in silage based diets. Anim. Feed Sci. and Technol. 114:1–18.
[16] Deddy Muchtadi dan Nurhaeni, S.P. 1992. Metoda Kimia Biokimia dan Biologi dalam Evaluasi Nilai Gizi Pangan Olahan. Departemen Pendidikan dan Kebudayaan Direktorat Jenderal Pendidikan Tinggi Pusat Antar Universitas Pangan dan Gizi Institut Pertanian Bogor. Bogor. Hal 119-121.
[17] Jaelani, A., A. Gunawan, and I. Asriani. 2014. Pengaruh Lama Penyimpanan Silase Daun Kelapa Sawit Terhadap Kadar Protein dan Serat Kasar. Ziraa'Ah. 39 (1) : 8-16.
[18] Sutardi, T. 2006. Landasan Ilmu Nutrisi Jilid 1. Departemen Ilmu Makanan Ternak. Bogor: Fakultas Peternakan IPB.