Chalaza Journal of Animal Husbandry

Url: http://usnsj.com/index.php/CJAH
Email: chalaza.usnsj@gmail.com

Soaking in Seawater of Rice Straw Increases *In Vitro* Dry Matter and Organic Matter Digestibility

AUTHORS INFO

Husnaeni
Universitas Sembilanbelas November Kolaka
husnaeni.hasja@gmail.com
+6285299984299

M. Arifin Amril
Fakultas Peternakan, Universitas Hasanuddin
m.arifinamril@gmail.com

Sjamsuddin Rasjid
Fakultas Peternakan, Universitas Hasanuddin
sjamsuddin.rasjid@gmail.com

ARTICLE INFO

o-ISSN: 2548-3803
p-ISSN: 2548-5504
Vol. 2, No.2, December 2017
URL:http://usnsj.com/index.php/CJAH/view/CJAH.2.2.1-6

Abstract

This research aims to improve the digestibility and nutritional value of rice straw as a ruminant animal feed and determine the effect of long soaking in sea water of rice straw on digestibility *in vitro* dry matter and organic matter. The used materials in this study are a bales machine, weighing scales, rapiah rope, poly bags, rice straw varieties Ciliwung obtained from rice fields in Bantimurung, sea water with 2.71% saline, as well as tools and chemicals for analysis of *in vitro* dry matter and organic matter digestibility with pepsin, calculus method. This study is done based on Randomized Complete Design (RCD) with 5 treatments and 4 replications. Variance based on the long soaking treatment gives the nature of the response curve linear on the digestibility of dry matter and also to organic matter digestibility. The magnitude of the correlation length relationship soaking rice straw and with sea water for *in vitro* dry matter and organic matter digestibility that is 96.5% and 96.8% respectively. Based on the results of research and discussion can be concluded that rice straw is soaked with sea water 3-12 days producing dry matter digestibility and organic matter are higher than the rice straw that is not soaked with sea water. Soaking of the sea water for 3-12 days increase the digestibility of dry matter and organic matter.

Keywords: rice straw, digestibility, *in vitro* and seawater

A. Introduction

The general problem of livestock business in Indonesia is the higher feed prices and the availability of livestock feed ingredients, both from the quality aspect and the provision of feed in a sustainable manner. This is due to the shifting of the function of agricultural land into settlements and industries that can reduce the opportunity of planting grass as the main food for ruminant livestock. This forage feed material is well known by season factor. During the

rainy season, it is available in large quantities and the abundance in the dry season is rather very limited. To overcome this, the breeders feed the rest of the farm like rice straw.

Rice straw from harvesting is not much eaten by livestock, even if it is given to cattle, there are only a few eat. It is because it has less favorable to livestock. So that after harvesting the paddy, the farmers only accumulate and allow the rice straw to dry and even burn. The rice straw has not been widely used by the community for ruminants. The barriers to the widespread use of rice straw for ruminant feed are low nutritional value when compared to forage feed. This is due to lower crude protein content, the lower energy content and low digestibility (only 37%) and the mineral content is mismatched so that the dry matter consumption is limited (Sitorus, 2002), the use of rice straw directly or as a single feed can not meet Supply of nutrients needed by livestock. In addition, collecting rice straw and transporting it around the house (settlement) is very difficult, because the rice fields are relatively far from home.

The abundant agricultural waste in the form of rice straw can be used in ruminant livestock to overcome the obstacle of providing animal feed material during the dry season, it is necessary to make an effort to increase the usefulness of the waste through a proper feed technology. One of the appropriate feed technology that is done in the processing of animal feed ingredients is to soak the rice straw in the sea water. The main constraining factor in the use of rice straw as animal feed is the low coefficient of digestibility and nutritional value (Abdullah, 2008).

B. Methodology

1. The Material

This research was divided into two stages. The first stage is the making of rice straw bales which are then soaked in seawater in the Feed Industry and Technology Laboratory, and the second stage of chemical analysis and digestibility in vitro dry matter & organic material at the Laboratory of Chemical Feed Faculty of Animal Husbandry, Hasanuddin University, Makassar. The tools used in this research are ball, scales, measuring cylinders, rope, oven, thermometer, 120 ml volume plastic, rubber stoppers, analytical balance, incubator, crucible g0och, stirrer, incubator, tube, polybag, pH measurement and furnace. The materials used are rice straw, salt water 2.71%, sodium carbonate, acid - pepsin, buffer cellulose – carbonate

2. The Method of Research Design

This research was conducted by using Completely Randomized Design (Gaspersz, 1991) with 5 treatments and 4 replications in which each replication consisted of 5 bales of rice straw weighing 10 kg / ball and the treatment was as follows:

P0 : rice straw bales are not soaked
T1 : rice straw bales are soaked for 3 days
T2 : rice straw bales are soaked for 6 days
T3 : rice straw bales are soaked for 9 days
T4 : rice straw bales are soaked for 12 days

3. The Research Procedures

This research was designed to determine the level of digestibility in vitro dry matter and rice straw organic material soaked in seawater. This research begins with the making of rice straw ciliwung varieties obtained from the area of rice field Bantimurung Maros. Then it was made in the form of bales weighing 10 kg / ball which amounted to 20 bals then done soaking with different time. After soaking, the aerated rice straw is milled. Furthermore, it conducted in vitro digestibility analysis at the Laboratory of Chemical Feed Faculty of Animal Husbandry, Hasanuddin University, Makassar.

In vitro digestibility, the research was performed using the cellulase pepsin method (Goto & Minson, 1977). The vitro stages begin with the sample weighed as much as ± 0.5 grammes and put into a plastic centrifuge tube of 120 ml volume. Then 25 ml of the pepsin - acid solution was added to each tube and then sealed the tube with rubber plug and then incubated for 72 hours at 500C, followed by fine shaking 6 times (shaking 1 time in 12-hour time scale). After that, the rubber plug was removed and 1.5 ml of sodium carbonate 1 mole was inserted through the tube wall and followed by the addition of 30 ml of cellulose acetate buffers into each tube. At this stage, the pH of the study sample is taken into account so that the pH of the sample becomes 4.5 - 4.7. If the pH of the sample is lower than the specified number, then sodium carbonate is added and if the pH of the sample is higher than the research sample then the acetic acid is added.

Then, the tube is closed and incubated for 48 hours at 500C and followed by fine shaking 4 times (Shuffle 1 time in a 12-hour time scale). Furthermore, the contents of the tubes are filtered through the crucible gooch that has been dried and weighed previously. The last stage is the crucible containing the research sample weighed and already dried. To determine the digestibility of organic matter, it has done by clarifying the sample for 3 hours at 5200C.

The calculation of digestibility :

$$DMD = \frac{100 - (WSG + Residu\ Oven - WSG\ E\mathit{mpty}) \times 100}{Dry\ Sample\ Weight\ of\ the\ Oven}$$

$$DOM = \frac{100 - (BSG + Residu\ Oven - BSG + Sample\ After\ Furnace) \times 100}{Heavy\ Organic\ Matter\ Dry\ Sample}$$

Description:
DMD = Dry Material Digestibility
DOM = Digestibility Organic Materials
WSG = Weight Sentered Glass

C. Result and Discussion

The average digestibility in vitro dry matter and organic rice straw material soaked in seawater with different soaking periods. And the statistic analyzed was doing under SPSS Ver.16.0 software. It could be seen in Table 1.

Table 1. The average digestibility in vitro dry matter and rice straw organic material soaked in seawater with different soaking periods

Treatment	*In vitro Digestibility* (%)	
	Dry Matter (DM)	Organic Matter (OM)
T_0	37,30 ± 0,429[a]	31,89 ± 0,309[a]
T_1	37,86 ± 0,524[a]	34,94 ± 0,878[b]
T_2	38,70 ± 0,168[b]	37,11 ± 0,251[c]
T_3	39,27 ± 0,697[b]	38,80 ± 0,963[d]
T_4	40,74 ± 0,379[c]	39,96 ± 0,482[e]

Description = superscripts Different in the same column show real differences (P <0.05)

Based on the variance in Table 1, it showed that soaking of straw in seawater significantly (P <0,05) to the digestibility of in vitro dry matter and organic matter. The average in vitro digestibility values of dry matter at each treatment were T0 (37,30) T1 (37,86), T2 (38,70), T3 (39,27) and T4 (40,74). In vitro digestibility, the value of the highest drying material in T4 treatment and lowest on T0 treatment. Based on the calculation of variance, it was seen that T0 was not significantly different with T1. But it was significantly different (P <0.05) with T2, T3 and T4. While T2 was not different from T3 but significantly different (P <0.05) with T0, T1 and T4. And T4 was significantly different (P <0.05) with T0, T1, T2 and T3.

The average in vitro digestibility values of organic matter at each treatment were T0 (31,89) T1 (34,94), T2 (37,11), T3 (38,80) and T4 (39,96). In vitro digestibility, the value of the highest organic material in the T4 treatment and the lowest in treatment T0. Based on the calculation of variance, it is seen that T0 is significantly different (P <0.05) with T1, T2, T3 and T4 as well as others. The result of analysis of soaking variety of rice straw in sea water by using otogonal polynomial test can be seen in Table 2.

Table 2. The Results of Analysis of Variety Effect of Soaking Rice Scraw Imprint in Sea Water Against In vitro Digestion Dry Material and Organic Material

Variance	Opportunity F table <F arithmetic	
	Dry Matter (DM)	Organik Matter (OM)
Treatment	< 0.01	< 0.01
Contrast 0 vs 1,2,3,4	< 0.01	< 0.01
Orthogonal Polynomial:		
- Linear	< 0.01	< 0.01
- Quadratic	> 0.05	< 0.01
- Cubic	> 0.05	> 0.05
- Quartiles	> 0.05	> 0.05

Description: Not Real (P> 0.05), Real (P <0.05) and Very Real (P <0.01)

1. Dry matter digestibility

The effect of long time immersion of rice straw in seawater on in vitro dry matter digestibility based on response curve analysis can be seen in figure 1.

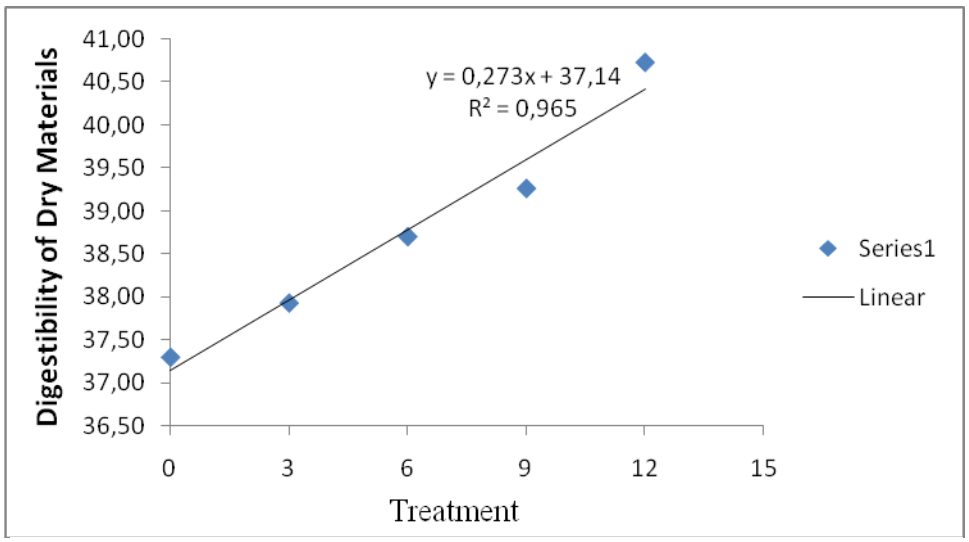

Figure 1. Curve of Response of Longer Effect of Immersion of Rice Straw with Sea Water Against In vitro Digestibility of Dry Material

Based on the results of the above response curve analysis, it is known that dry matter gives a linear response to the duration of soaking of straw in seawater. The magnitude of the long correlation relationship of soaking rice straw in seawater to digestibility in vitro dry matter is 96.5%. It means 96.5% influence of immersion duration to increase in vitro digestibility of rice straw dry matter. It can be seen in Table 1. That the average digestibility of in vitro dry matter has increased from each treatment from T1 to T4.

2. Organic Material Degradation

The effect of long immersion of paddy straw in seawater on in vitro digestibility of organic matter based on response curve analysis could be seen in figure 2.

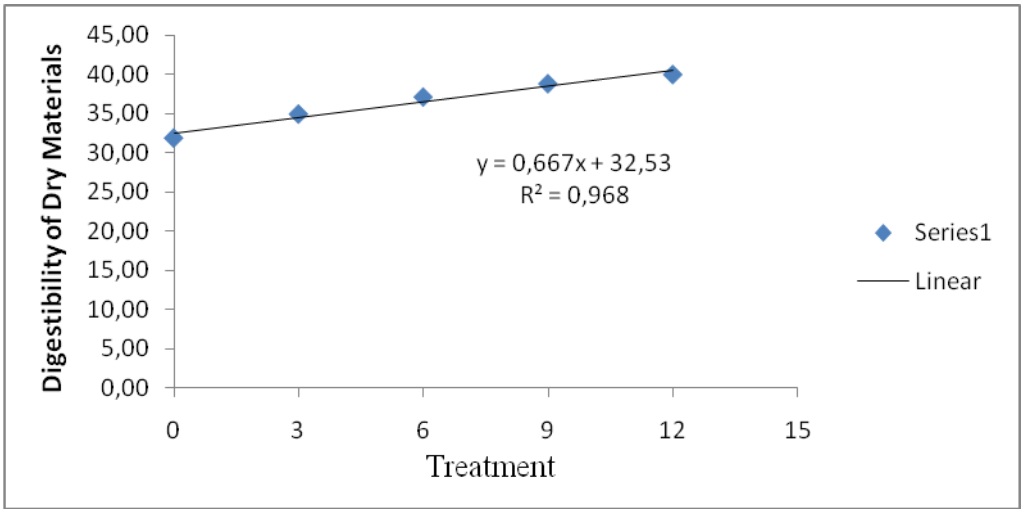

Figure 2. Response Curve of Longer Effect of Soaking Rice Straw in Sea Water Against In vitro Digestibility of Organic Material

Based on the results of the response curve analysis above, it is known that the organic material gives a linear response for the duration of soaking the straw with sea water. The magnitude of the correlation relationship of long rice paddy straw in sea water to the digestibility of in vitro dry matter is 96,8%. This means 96.8% influence of immersion duration to increase in vitro digestibility of rice straw dry matter. This can be seen in Table 1. That is average In vitro digestibility of dry matter has increased from each treatment from T1 to T4.

In vitro digestibility of dry matter and rice straw organic material is done by mimicking the process that occurs in the digestive tract of ruminants. This in vitro technique is performed by the addition of pepsin and cellulose enzymes. This is supported by an opinion (Rahima, 2010) that in vitro techniques can be performed by the addition of enzymes such as pepsin and cellulose enzymes. The pepsin is an enzyme found in the stomach that will begin to digest proteins by breaking down proteins into smaller parts. These enzymes include proteases; Pepsin is secreted in the inactive form, pepsinogen, to be activated by stomach acid. Furthermore, it is explained by Rahima (2010) that cellulose is the name for all enzymes that break the beta-1,4 glycosidic bond in cellulose, sedo dextrin, cellobiose and other cellulosic derivatives. Chemulase is not owned by humans, therefore humans can not decompose cellulose.

The occurrence of increase in digestibility in vitro dry matter and rice straw organic material soaking in seawater from day 3 to day 12 that is on a treatment T1 to T4 which indicates that soaking in sea water is one way that can improve digestibility Dry ingredients and organic matter proven in T0 treatment is lower than other treatments and the longer time immersion digestibility of rice straw dry material is increasing. This is caused by the content of NaCl by sea water where NaCl is one of the minerals needed by the body of livestock. The increasing digestibility of rice straw is caused by mineral content that can affect the condition of the rumen. This is in accordance with the opinion of Prabowo (1984) which states that increased digestibility by increasing the proportion of mineral additions can be explained as a result of the influence of rumen conditions so that the degradation of nutrients by rumen microbes also increases. This suggests that even if the mineral needs are met, the benefits of mineral addition can still be obtained by stimulating the digestibility of the nutrients in the rumen.

NaCl is one of the chemicals that can be used to improve the dry materials and organic materials. The use of NaCl as well as the use of alkali such as lime where the addition of lime treatment can improve digestibility. It proves Saadullah, Haque & Dolber (1981) that with the addition of lime (alkali) treatment increased the digestibility of rice straw dry matter from 38% to 49%, and with the addition of 10% molasses and urea containing 2% N, increased paddy rice digestibility by 54% Dry matter consumption up to 71.3 g / kg $W^{0.75}$.

In addition to the treatment with chemicals also occur the physical treatment of soaking where the immersion is thought to be able to overhaul the cell wall layer such as lignin so that microorganisms can digest cellulose and hemicellulose. In line with Bulo & Munier (2008) that the processing of rice straw physically as cut, milled, soaked, boiled, made pellets and irradiation gamma will break the cell wall layer like lignin and expand the surface of food particles so that rumen microorganisms can be directly Digest cellulose. The speed of fermentation will increase, food retention time will decrease and feed consumption increase.

Soaking rice straw with sea water for several days has a significant effect on the digestibility of dry matter and organic matter. Actually, it is not in line with Badurdeen, Ibrahim & Schiere (1994) which states that wetting rice straw with salt water (NaCl) significantly does not affect the digestibility or intake of rice straw.

D. Conclusion

Based on the results of the study, it was concluded that the 3-12 days sea water soaked rice straw produce the higher dry matter digestibility and organic matter if it is compared with the unsoaked sea water rice straw. The 0-12 days immersion time duration difference provides a linear response to dry matter as well as to organic matter. The highest dry matter digestibility and the highest organic material based on the response curve is seen at 12 days of soaking time.

E. References

Abdullah. (2008). *Pembuatan Jerami Padi Amoniasi Sebagai Sumber Pakan Ternak Potensial Di Kecamatan Ujung Loe Kabupaten Bulukumba*. Program penerapan IPTEKS.

Badurdeen, A.L., Ibrahim, M.N.M. & Schiere J.B. (1994). Methods to improve utilization of rice straw i. effects of moistening, sodium chloride and choping on intake and digestibility. *AJAS., 7*(2), pp. 159 – 164

Bulo, D. & Munier, F. (2008). *Petunjuk Teknis Teknologi Pendukung Pengembangan Agribisnis Di Desa P4mi (Pengolahan Jerami Padi Sebagai Pakan Ternak)*. Badan Penelitian Dan Pengembangan Pertanian Balai Pengkajian Teknologi Pertanian. Sulawesi Tengah.

Gasperz, V. (1991). *Metode Perancangan Percobaan untuk Ilmu-ilmu Pertanian, Ilmu-ilmu Teknik dan Biologi*. Bandung: CV. Armico.

Goto, I. & Minson. (1977). Prediction of the Dry matter digestibility of tropical grasses using a pepsi-cellulase assay. *Anin. feed sci. technol.,* 2, pp. 247-253

Prabowo. (1984). *Komsumsi dan Daya Cerna Rumput Gajah Oleh Domba pada Berbagai Tingkat Penambahan Mineral.* SR-CRSP/Balai Penelitian Ternak P.O. Box 210. Bogor, alai Penelitian Ternak

Rahima, D. (2010). *Optimasi Produksi Enzim Selulase untuk Hidrolisis Jerami Padi*. Kementerian Kesehatan R.I. Politeknik Kesehatan Kemenkes., Jurusan Gizi, Palangka Raya, http://www.scribd.com/doc/55253242/enzim-selulase.

Saadullah, M., Haque, F. & Dolber. (1981). *Treatment of Rice Straw With Lime*. Bangladesh; Departement of General Animal Science, Bangladesh Agricultur University Mymrnsingh.

Sitorus, T. F. (2002) *Peningkatan Nilai Nutrisi Jerami Padi dengan Fermentasi Ragi Isi Rumen*. Thesis. Semarang: Program Studi Magister Ilmu Ternak Program Pasca Sarjana Fakultas Peternakan Universitas Diponegoro.