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Nutritional Value Quality of Banana Stem Waste and Field Grass as Sheep Feed Through Silage Technology

Kualitas Nilai Nutrisi Limbah Batang Pisang dan Rumput Lapang sebagai Pakan Ternak Domba Melalui Teknologi Silase

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ABSTRAK

Penelitian kombinasi rumput lapang dan batang pisang melalui teknologi silase merupakan salah satu alternatif untuk penyediaan pakan ternak ruminansia. Tujuan dari penelitian ini adalah (1) mengetahui kualitas nilai nutrisi pakan silase kombinasi rumput lapang dan batang pisang; (2) mengetahui imbangan terbaik dari silase pakan kombinasi rumput lapang dan batang pisang. Metode yang digunakan yaitu eksperimental menggunakan Rancangan Acak Lengkap (RAL). Perlakuan yang diuji terdiri dari 4 perlakuan dan 5 ulangan. P0 (Rumput lapang 100%); P1 (Rumput lapang 90% + Batang pisang 10%); P2 (Rumput lapang 80% + Batang pisang 20%); P3 (Rumput lapang 70% + Batang pisang 30%). Semua perlakuan dibuat silase dengan penambahan bahan pollard 8%, molases 1% dan air cucian beras 1%. Peubah yang diamati meliputi nilai bahan kering, kadar abu, serat kasar, protein kasar, lemak kasar, abu, BETN, TDN dan Energi Brutto. Hasil penelitian menunjukan bahwa kualitas silase rumput lapang dan batang pisang dapat digunakan sebagai pakan alternatif untuk domba lokal. Imbangan silase pakan terbaik yaitu pada P3 dengan kombinasi rumput lapang 70% dan batang pisang 30%.

Kata Kunci: *Batang Pisang, Fermentasi, Limbah Pertanian, Rumput Lapang, Silase*.

ABSTRACT

Research on the combination of field grass and banana stems through silage technology is one alternative for providing ruminant livestock feed. The objectives of this study were (1) to determine the quality of the nutritional value of silage feed combination of field grass and banana stems; (2) to determine the best balance of silage feed combination of field grass and banana stems. The method used was experimental using a Completely Randomized Design (CRD). The treatments tested consisted of 4 treatments and 5 replications. P0 (100% field grass); P1 (90% field grass + 10% banana stems); P2 (80% field grass + 20% banana stems); P3 (70% field grass + 30% banana stems). All treatments were made into silage with the addition of 8% pollard, 1% molasses and 1% rice

washing water. The variables observed included dry matter value, ash content, crude fiber, crude protein, crude fat, ash, BETN and TDN. The results of the study showed that silage of field grass and banana stems can be used as alternative feed for local sheep. The combination of field grass and banana stems can increase the nutritional value of crude protein, TDN and BETN significantly different. The best feed silage balance was obtained in treatment (P3) with a combination of 70% field grass and 30% banana stems.
Keywords: *Banana Stem, Fermentation, Agricultural Waste, Field Grass, Silage*.

PENDAHULUAN

Local sheep farmers are still very traditional and depend on open grass. Local farmers do not want to switch from open grass because it does not require costs to obtain it, it is abundant and they do not have land to plant it. Meanwhile, open grass is fought over by other farmers and during the dry season its number decreases. Farmers often complain about the difficulty of finding grass during the dry season because the grass dries up. This condition requires farmers to look for grass in a further place, which will be inefficient because it takes time, energy and money. Farmers are unable to carry out other productive activities that can support their income. (Fadliana et al., 2021).

Banana stems are agricultural or plantation waste that has the potential as an alternative feed for sheep. Banana stems have advantages including being available throughout the season, easy to produce, easy to find, no cost, no competition to get them, and abundant in quantity. Banana plants have the largest proportion in the stem section at 60% while banana fruit is 30% and banana leaves are 10% (Misran et al., 2022). Banana plants can only be harvested once, while the stems must be cut so as not to interfere with the growth of other banana plants. This results in an abundant supply of banana stems, making them potential as animal feed. (Thiasari & Iskandar Setiyawan, 2016). Banana stems have a dry matter nutritional content of 87.7%, ash 25.12%, crude fat 14.23%, crude fiber 29.40%, crude protein 3.01% and nitrogen-free extract 28.24% (Santi et al., 2012). The weakness of banana stems as feed for sheep is that they rot easily and contain tannin which will interfere with the digestion of organic materials. (Dhalika & Budiman, 2011).

Therefore, there needs to be an effort aimed at improving the quality of the nutritional value of the combination of field grass and banana stems. Feed processing technology that can maintain the durability of banana stems and improve the quality of their nutritional value is through silage. Silage is a technology for preserving green fodder by fermenting it in a silo under anaerobic conditions. Silage is made from green fodder that still has high water content (± 65-75%) (Wiguna et al., 2024). Preserving feed through silage can increase the

storage capacity of green fodder with a lower level of nutrient loss compared to feed left at room temperature (Coblentz & Akins, 2018). The principle of making silage is to maintain airtight conditions in the silo so that bacteria can produce lactic acid to help lower the pH, prevent oxygen from entering the silo, thus inhibiting the growth of fungi during storage (Hidayat, 2014). The process of making good silage lasts for 21 days, after which the silage can be used as animal feed or stored for a long time if it has not been used (Bolsen, 2018).

In the complete feed silage, pollard, molasses and rice washing water additives are also added. Gunawan et all., (1998) Additives in complete feed silage have functions including: 1). increasing the availability of nutrients, 2). increasing the nutritional value of silage, 3). increasing palatability, 4). accelerating the creation of acidic conditions, 5). stimulating the formation of lactic and acetic acids, 6). obtaining easily fermentable carbohydrates as an energy source for bacteria that play a role in fermentation, 7). inhibiting the growth of several other types of bacteria and unwanted fungi, 8). reducing the oxygen present both directly and indirectly, 9). reducing water production and absorbing some unwanted acids. The objectives of this study were (1) to determine the nutritional quality of a combination of field grass and banana stem silage; (2) to determine the best balance of a combination of field grass and banana stem silage.

MATERI DAN METODE

Preparation and Treatment. This research used a Completely Randomized Design (CRD) with 4 treatments and 5 replications. The treatments given were: P0 = Field grass 100%; P1 = field grass 90% + banana stems 10%; P2 = field grass 80% + banana stems 20%; P3 = field grass 70% + banana stems 30%. All treatments were made into silage by adding 8% pollard, 1% molasses and 1% rice washing water.

Silage Making. Prepare field grass that has been wilted for 12 hours; 2) Prepare banana stems, cut into 10 cm pieces and dry them for 2 days sun drying until the water content reaches 60-70% 3) Prepare 8% pollard 4) Dissolve 1% molasses in the rice washing water (if the amount of grass and banana stems is 50 kg, then use 0.5 kg of molasses dissolved in 1 liter of rice washing water). 5) Sprinkle field grass and banana stems into the drum 6) Pour molasses liquid and sprinkle with pollard 7) Sprinkle field grass and banana stems again, pour molasses liquid and sprinkle with pollard 8) Repeat this process while stepping on/pressing to compact until the field grass, banana stems, molasses liquid and pollard are used up 9) When the drum is almost full, sprinkle the top part again with 5 cm thick pollard 10) Close the drum tightly and lock the hook 11) Field grass and banana stems are incubated in the drum for 3 weeks 12) After 3 weeks, the complete feed silage based on field grass and banana stems is ready to be harvested 13) Take samples and measure the observed variables

Variables observed. The observed variables include dry matter, crude fiber, crude protein, crude Fat, Ash, BETN and TDN. Samples of banana stem and field grass waste silage products were analyzed using the proximate method (AOAC, 2005).

Statistical analysis. Statistical analysis to determine the experimental response to the treatment given is carried out using statistical tests using analysis of variance. If the results of the F test have a significant effect, it is continued with the Duncan Multiple Range Test (DMRT).

HASIL DAN PEMBAHASAN

Making silage from field grass and banana stems is an alternative feed for local sheep. Making silage from field grass and banana stems has the potential to contain good nutritional quality values. The nutritional quality values of silage from field grass and banana stems can be seen in table 1.

Table 1. Nutritional Quality Content of Field Grass and Banana Stem Silage.

Perlakuan	P0	P1	P2	P3
Dry Ingredients %	27.74±0.23^{b}	27.59±2.66^{ab}	26.41±0.80^{ab}	25.67±0.46^{a}
Ash %	11.30±0.24^{c}	10.67±0.29^{bc}	10.37±0.65^{b}	9.52±0.58^{a}
Crude Protein %	11.81±0.17^{a}	12.15±0.15^{b}	12.83±0.16^{c}	13.59±0.30^{d}
Crude Fiber %	33.12±0.33^{d}	31.11±0.32^{c}	29.70±0.51^{b}	26.77±0.34^{a}
Crude Fat %	2.13±0.23^{a}	2.24±0.31^{a}	2.26±0.10^{a}	2.33±0.17^{a}
BETN %	41.65±0.79^{a}	43.30±0.91^{b}	44.89±0.50^{c}	47.79±0.54^{d}
TDN %	44.28±0.43^{a}	47.50±0.40^{b}	49.32±0.22^{c}	53.56±1.10^{d}

Different superscripts in the same row indicate significantly different effects (P<0.05)

The nutrient content of feed greatly affects the performance of livestock production. Therefore, farmers must know and understand how to make feed formulations that suit livestock needs in order to obtain good results. Livestock production performance will show good results if given feed with good nutrient content.

Ash Content Analysis

The ash content in feed is a parameter for determining minerals, which is a sign of the success of the demineralization process. (Ria Harmayani, et al., 2022). A lower ash content in feed indicates higher feed purity and quality. The lower ash content in field grass and banana stem silage indicates a higher organic matter content, which is an indicator of high feed digestibility. The results showed a significant difference (P<0.05) in the ash content of field grass and banana stem silage. The ash content of P0 and P3 differed significantly (P<0.05) compared to P1 and P2.

In silage preparation, the ash content decreases, presumably due to the addition of additives such as molasses, rice washing water, and pollard. Therefore, in silage preparation, the total ash content of the mixed ingredients decreases due to the effects of mixing and dilution. Furthermore, the ash content also decreases due to the fermentation process, where microorganisms utilize the dissolved carbohydrates in water and minerals, resulting in changes in nutrient composition. The low ash

content in the fermentation process is caused by microbes only utilizing the minerals contained in the material (Yuvitaro et al., 2012).

Crude Protein Content Analysis

All substances containing nitrogen are interpreted as crude protein. The average nitrogen content in the protein of field grass silage and banana stems increased by 13.59 ± 0.30. The results of the study showed that the protein levels were significantly different (P<0.05) in field grass silage and banana stems. This is because it is indicated that there is lactic acid bacteria activity, where good quality silage will be produced when fermentation is dominated by bacteria that produce lactic acid, while the activity of clostridia bacteria is low. The crude protein content in P0, P1, P2 and P3 was significantly different at (P<0.05). Carbohydrates are a source of energy that is easily utilized by lactic acid bacteria to produce lactic acid (Sutowo et al., 2017). Santi et al. (2011) states that lactic acid bacteria have the ability to ferment sugar into lactic acid. This condition can affect the PK content because the body of bacteria contains 80% protein. The more bacteria in the silage process, the more PK will be found in the substrate.

Crude Fiber Content Analysis

The results of the analysis of variance showed that the crude fiber content was significantly different (P<0.05) in the field grass silage and banana stems. The crude protein content in P0, P1, P2 and P3 was significantly different (P<0.05). However, the average crude fiber content in the field grass silage and banana stems decreased. Santi et al. (2011) explained that low SK levels can be caused by the presence of fermentation heat and low pH from organic acids which cause the carbohydrate components of SK to undergo hydrolysis or decomposition so that many parts dissolve.

Crude Fat Content Analysis

Crude fat content is often also called ether extract, because food ingredients are analyzed through extraction using fat solvents (ether), and the results obtained are in the form of fat or lipids. Lipids are a group of substances that are insoluble in water but soluble in ether, chloroform, and benzene. These substances include fat, phosphatides, sterols, and others. The crude fat content in grass silage and banana stem feed has almost the same value. The results showed that the crude fat content was not significantly different (P>0.05) in grass silage and banana stem. This is in accordance with the research results (Sutowo et al., 2017) that during the silage process there is not much breakdown of fat into fatty acids. In the silage process the bacteria that develop are LAB which produce lactic acid and do not produce lipase enzymes.

Analysis of Nitrogen-Free Extract (NIE) Content

BETN is part of carbohydrates, and carbohydrates can also be separated based on the type of sugar substance consisting of monosaccharides, disaccharides, trisaccharides, and polysaccharides. Starch is a type of polysaccharide sugar which is a good source of

energy, while cellulose which contains hexose (sugar) and is found in crude fiber, is a low source of energy. For single-stomach livestock, cellulose cannot be digested, but for ruminants with the help of rumen bacteria, both cellulose and hemicellulose can be digested enzymatically. The BETN content in field grass silage and banana stems is higher than field grass alone. This allows the digestibility of field grass silage and banana stems to be higher than field grass alone. BETN contains mono, di, tri, and polysaccharide substances, especially starch which is easily soluble in acidic and alkaline liquids in crude fiber analysis and has high digestibility. The results showed that the levels of crude fiber and BETN content were significantly different ($P<0.05$) in field grass silage and banana stems. Crude Protein and Crude Fiber contents showed an increase in P0, P1, P2 and P3. The increase in these values is thought to also have an effect on the increase in BETN.

KESIMPULAN

Field grass and banana stem silage can be used as alternative feed for local sheep. The combination of field grass and banana stem can increase the nutritional value of crude protein, TDN and BETN which are significantly different. The best feed silage balance was obtained in treatment (P3) with a combination of 70% field grass and 30% banana stem.

DAFTAR PUSTAKA

AOAC. (2005). Official Methods of Analysis.

Bolsen, K. K. (2018). Silage review: Safety considerations during silage making and feeding. Journal of Dairy Science, 101(5), 4122–4131. https://doi.org/10.3168/jds.2017-13738

Coblentz, W. K., & Akins, M. S. (2018). Silage review: Recent advances and future technologies for baled silages. Journal of Dairy Science, 101(5), 4075–4092. https://doi.org/10.3168/jds.2017-13708

Dhalika, T., & Budiman, A. (2011). Nutritional Value of Banana Stems from Bioprocessed Products (Ensilage) as Complete Rations. 11(1).

Fadliana, A., Choirina, P., Tjiptady, B. C., Fitriani, I. M., & Pradhana, C. (2021). Preservasi Pakan dengan Teknologi Ensilase untuk Optimalisasi Ketersediaan Bahan Pakan Ternak Hijauan di Desa Ngasem Kecamatan Ngajum Kabupaten Malang. I-Com: Indonesian Community Journal, 1(1), 24–34. https://doi.org/10.33379/icom.v1i1.957

Gunawan, B. Tangendaja, D. Zainuddin, J. Darma dan A. Thalib. 1988. Silase. Laporan Penelitian. Balai Penelitian Ternak Ciawi, Bogor.

Hidayat, N. (2014). Karakteristik dan Kualitas Silase Rumput Raja Menggunakan Berbagai Sumber dan Tingkat Penambahan Karbohidrat Fermentable. Jurnal Agripet, 14(1), 42–49. https://doi.org/10.17969/agripet.v14i1.1204

Misran, E., Bani, O., Situmeang, E. M., & Purba, A. S. (2022). Banana stem based activated carbon as a low-cost adsorbent for methylene blue removal: Isotherm, kinetics, and reusability. Alexandria Engineering Journal, 61(3), 1946–1955. https://doi.org/10.1016/j.aej.2021.07.022

Ria Harmayani, Et Al. (2022). Nutritional Value of Sugarcane Bagasse Silage (Saccharum Officinarum L.) Fermented with Urea, Probiotics, Molasses and Lime (Ca(OH)2) as Cattle Feed. Jurnal Agribisnis dan Peternakan, 2(1), 6–11.

Santi, R. K. D. Widyawati, W. P. S. dan Suprayogi. 2011. Quality and In Vitro Digestibility Value of Banana Stem Silage (Musa Paradisiaca) with the Addition of Several Accelerators. Jurnal Tropical Animal Husbandry. 1(1):15-23.

Santi, R. K., Fatmasari, D., & Widyawati, S. D. (2012). Kualitas dan Nilai Kecernaan In Vitro Silase Batang Pisang (Musa paradisiaca) dengan Penambahan Beberapa Akselerator. 1.

Sutowo, I., Adelina, T., & Febrina, D. (2017). Kualitas Nutrisi Silase Limbah Pisang (Batang Dan Bonggol) Dan Level Molases Yang Berbeda Sebagai Pakan Alternatif Ternak Ruminansia. Jurnal Peternakan, 13(2), 41. https://doi.org/10.24014/jupet.v13i2.2417

Thiasari, N., & Iskandar Setiyawan, A. (2016). Complete feed batang pisang terfermentasi dengan level protein berbeda terhadap kecernaan bahan kering, kecernaan bahan organik dan TDN secara in vitro. Jurnal Ilmu-Ilmu Peternakan, 26(2), 67–72. https://doi.org/10.21776/ub.jiip.2016.026.02.9

Yuvitaro, N.N.,S. Lestari, dan S.Hangita R.S. 2012. Karakteristik Kimia dan Mikrobiologi SilaseKeong Mas dengan Penambahan Asam Format dan Bakteri Asam Laktat 3B104. Jurnal Program Studi Perikanan. Universitas Sriwijaya, Palembang.

Wiguna, I. A., Patty, C. W., & Fredriksz, S. (2024). Kualitas Fisik Silase Jerami Padi Dengan Penambahan Dosis EM4 Yang Berbeda Sebagai Pakan Ternak Ruminansia. Jurnal Agrosilvopasture-Tech, 3(1), 127–133. https://doi.org/10.30598/j.agrosilvopasture-tech.2024.3.1.127.