*Short Research Article*

Evaluation of Silage Fresh Odot Grass (*Pennisetum purpureum* cv. Mott) as Ruminant Feed

ABSTRACT

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| --- |
| **Aims:** This study aimed to evaluate the effect of different types and levels of absorbents—milled rice husk, rice bran, and pollard—on the nutritional quality, pH value, and digestibility of odot grass (*Pennisetum purpureum* cv. Mott) silage.  **Study design:** The study employed a completely randomized design with three treatment levels of absorbent additions (12.5%, 22%, and 32.4%) for each type of absorbent, with five replications per treatment.  **Place and Duration of Study:** The experiment was conducted over a period of two months at the Sumber Sekar Field Laboratory, Faculty of Animal Husbandry, Brawijaya University, Malang, East Java. Laboratory analyses were carried out at the Batu Training Center (BBPP) and the Animal Nutrition and Feed Laboratory of the same faculty.  **Methodology:** Fresh chopped odot grass with up to 80% moisture content was mixed with absorbents (milled rice husk, rice bran, or pollard) at varying levels, combined with 5% molasses, then ensiled. The target moisture contents were 30%, 35%, and 40%. After obtaining the treatment with the best pH value at P3 with the addition of 32.4% absorbent. The highest absorbent level (32.4%) from each treatment was analyzed for nutrient content and best pH value to continue in vitro digestibility (dry matter digestibility—DMD and organic matter digestibility—OMD) tests.  **Results:** The lowest pH value was obtained at P3 (32.4% addition) with an average of 3.7 and then tested digestibility value. The addition of 32.4% pollard produced the highest digestibility values, with DMD at 76.65% and OMD at 62.62%, significantly outperforming husk and rice bran treatments (P < 0.01). This improvement was attributed to pollard’s lower crude fiber and higher protein content, which enhance rumen microbial activity. Nutrsed with higher absorbent levels.  **Conclusion:** The type and level of absorbents significantly affected odot grass silage quality. The use of 32.4% pollard was found to be the most effective strategy to improve fermentation, can make the lowest pH value, and enhance silage digestibility, making it a practical approach to ensure a consistent, high-quality ruminant feed supply year-round. |

*Keywords: Odot Grass, Moisture Content, Absorbant, Silage, In Vitro Digestibility*

1. INTRODUCTION

The ruminant feed industry plays a crucial role in producing healthy, efficient, and sustainable livestock. Its primary function is to provide high-quality, standardized, and continuously available feed, particularly forages, which are the primary feed for ruminants. One potential forage widely cultivated is odot grass (*Pennisetum purpureum* cv. Mott), known for its high biomass production, rapid growth, responsiveness to organic fertilizers, and excellent nutritional value for livestock. Its abundant availability, especially during the rainy season, often fails to be optimally utilized by livestock farmers due to limited storage capacity. This is because most livestock farmers in Indonesia still use a cut-and-carry system without any preservation methods, leading to dependence on the availability of fresh grass and impacting feed supply fluctuations. Therefore, a method for preserving fresh odot grass is needed as an alternative to maintain a continuous feed supply throughout the year. One preservation method suitable for Indonesia's climatic conditions is silage, a method that allows fresh grass to be fermented under anaerobic conditions without the need for sun-drying, thus maintaining its nutritional quality.

However, making silage from fresh odot grass presents a major challenge due to its very high moisture content, particularly during the rainy season, which can reach 80–85%. The ideal moisture content for silage fermentation is around 65% to ensure optimal fermentation and prevent spoilage. To achieve optimal moisture content in fresh odot grass silage, it is necessary to add materials with a high dry matter (DM) content as absorbents capable of lowering the initial moisture content of the forage to an appropriate level. The absorbents used in this study included milled rice husks, rice bran, and pollard, each of which has different chemical and physical characteristics in absorbing moisture. Rice husks have high absorption capacity but almost no nutritional content, rice bran has fluctuating nutrients with moderate absorption quality, while pollard contains high nutrients but has low absorption capacity. As research by Fangiadae et al. (2024) concluded, using rice straw (low-moisture feed) as an absorbent up to 30% in the production of odot grass silage can reduce water content to the optimal range. The addition of absorbent not only reduces water content but also supports the growth of lactic acid bacteria, which play a role in producing lactic acid as a natural preservative in the silage process. Lactic acid bacteria growth requires a substrate in the form of water-soluble carbohydrates (WSC), the content of which in odot grass is not yet known for certain. Therefore, it is necessary to add molasses as an additional energy source.

Based on this background, it is necessary to conduct a comprehensive evaluation of the quality of fresh odot grass silage, especially to determine the effect of adding various types of absorbents on the final quality of the product. So that it can produce quality silage, as well as increase the nutrient value. The evaluation was carried out based on nutrient quality parameters, pH value, and digestibility value. Through this aplisproach, odot grass is not only used as fresh green fodder, but also as a raw material for processed feed with added value that is durable, efficient, and practical for use by farmers.

2. material and methods

**2.1 Study Design and Experimental**

This study was conducted over a period of 2 months at the Sumber Sekar Field Laboratory, Faculty of Animal Husbandry, Brawijaya University, located in Sumbersekar, Dau District, Malang Regency, East Java. Proximate analysis of the silage was performed at the Batu Training Center (BBPP) Laboratory in Songgokerto, Batu District, Batu City, East Java, while in vitro digestibility analysis was conducted at the Animal Nutrition and Feed Laboratory, Faculty of Animal Husbandry, Brawijaya University.

**2.2 Preparation and Treatment Groups**

The research employed a completely randomized design (CRD) with three levels of absorbent addition: 12.5%, 22%, and 32.4%. Each absorbent type—milled rice husk, rice bran, and pollard—was mixed with odot grass and supplemented with 5% molasses as a fermentation enhancer. The treatments were designed to achieve target silage moisture contents of 30%, 35%, and 40%, and each treatment was replicated five times.  
The treatment groups were as follows:

* **P1**: 87.5% odot grass + 12.5% absorbent
* **P2**: 78% odot grass + 22% absorbent
* **P3**: 67.6% odot grass + 32.4% absorbent

After obtaining the treatment with the best pH value at P3 with the addition of 32.4% absorbent. The digestibility analysis will be continued with just P3 treatment.

**2.3 Observation**

Silage samples were observed after the fermentation period. Observations focused on evaluating the effects of different absorbent types and levels on nutrient preservation, pH value, and digestibility.

**2.4 Parameters Observed**

The observed variables included:

* Nutrient content (dry matter, crude protein, crude fiber, ash, etc.)
* pH Value
* Dry Matter Digestibility (DMD)
* Organic Matter Digestibility (OMD)

Digestibility tests were conducted in vitro and only at the highest absorbent level after obtaining the treatment with the best pH value at P3 with the addition of 32.4% absorbent.

**2.5 Statistical Analysis**

All collected data were analyzed using Analysis of Variance (ANOVA) to determine significant differences among treatments. If significant differences were detected (P < 0.05 or P < 0.01), the analysis was continued using Duncan's Multiple Range Test (DMRT) to identify differences between treatment means.

3. results and discussion

**3.1 Nutritional Content**

The nutritional content of feed includes carbohydrates, proteins, fats, fibers, vitamins, and minerals, which play an important role in meeting livestock productivity needs. The nutritional content of silage materials is presented in table 1.

Table 1. Nutritional Content of Silage Raw Materials.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Silage Ingredients | Nutritional Content (%) | | | | | | |
| Dry Matter | Ash\* | Crude Protein\* | Crude Fat\* | Crude Fiber\* | TDN\* | nitrogen-free extract \* |
| Odot Grass | 11.76 | 16.3 | 9.88 | 0.91 | 33.63 | 53.78 | 55.58 |
| Husks | 87.93 | 21.57 | 2.6 | 0.3 | 50.33 | 42.96 | 46.77 |
| Rice Bran | 82.74 | 20.09 | 5.41 | 1.3 | 34 | 54.6 | 59.29 |
| Pollard | 87.16 | 4.87 | 17.15 | 2.31 | 10.08 | 79.68 | 70.46 |

Description: Nutrient content based on analysis results from the Batu Training Center (BBPP) Laboratory Batu City, Jawa Timur

(\*) based on % DM

Table 1 shows the differences in the content of unprocessed or processed odot grass by wilting or chopping. The study used odot grass chopper to facilitate the process of mixing each ingredient and putting it in the barrel. The nutrient content of odot grass in the study was classified as standard from the report of Wildan (2015) in Patmawati et al. (2023) that odot grass also has a leaf fat content of 2.72%, stem fat content of 0.19%, leaf crude protein of 14.22%, stem crude protein of 8.10%, leaf digestibility of 72.68%, digestibility of stems 62.56% and crude protein 14%. Milled husk, rice bran, and pollard have high DM content which is suitable as an absorbent. Pollard has a good nutritional content value with a CP of 17.15%, the highest compared to all the constituent materials. The milled rice husk of the study has a nutritional content that is classified as normal, according to the report of Anggara et al. (2020), namely that rice husk has a water content of 12.5%, crude fiber 22%, fat 2.7%, protein 3.1%, and ash 17.5% with very low digestibility. The rice bran of the study has a nutritional content that is classified as normal according to Koni et al. (2022), namely that rice bran has a chemical composition of dry matter of 89.41%, crude protein 8.69%, crude fiber 29.43%, crude fat 7.9%, ash 13.13%, phosphorus 0.223%, calcium 0.0062%. Also, the nutritional content value of pollard research according to the report of Fajri et al (2018) in Rosani and Hernaman (2024) the nutrient content of pollard is 8.04% crude fiber, 4.7% crude fat, 88.17% dry matter, and 4.78% ash.

**3.2 pH Value**

The degree of acidity or pH is important as an indicator of the quality level of a material, especially related to materials intended as consumption materials for living creatures. Based on the analysis of silage characteristics, the pH of odot grass silage with different types of absorbents at different levels is presented in table 2.

Table 2**.** pH of odot grass silage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Level (%) | Absorbent Type | | | Average |
| Husk | Rice Bran | Pollard |  |
| P1 | 5.8b ± 0.7 | 3.9a ± 0.1 | 4.4b ± 0.5 | 4.7b ± 0.9 |
| P2 | 3.7a ± 0.1 | 3.7a ± 0.01 | 3.9a ± 0.1 | 3.8a ± 0.1 |
| P3 | 3.5a ± 0.04 | 3.8a ± 0.03 | 3.8a ± 0.1 | 3.7a ± 0.03 |
| Average | 4.3b ± 0.3 | 3.8a ± 0.1 | 4a ± 1.2 |  |

Description: P1: 87.5% odot grass + 12.5% ​​absorbent; P2: 78% odot grass + 22% absorbent; P3: 67.6% odot grass + 32.4% absorbent.

Different superscripts in the same column indicate highly significant differences (P<0.01)

Table 2 shows that the addition of absorbents at different levels has a very significant effect (P <0.01) on the pH of odot grass silage. Odot grass silage showed the lowest pH value at P3 (3.73) followed by P2 (3.76) and P1 (4.68). Also, odot grass silage showed the lowest pH value in the bran type (3.79) followed by Husk (4.03), and Pollard (4.33). The pH value of the research results showed a value that was classified as normal for silage. According to Alfatah et al. (2023) which states that the quality of silage based on pH value is categorized into pH 3.5 - 4.2 is silage with very good quality, 4.2 - 4.5 is silage with good quality, 4.5 - 4.8 is silage with medium quality, and more than 4.8 is silage with poor quality. Putra's report (2017) also stated that odot grass silage with the addition of 20% pollard produced an average pH of 4.58.

The difference in silage pH is caused by the activity of LAB in producing lactic acid. The rapid production of lactic acid will be followed by an increase in acidic conditions. (Irawan et al., 2021). This will cause the pH of the silage to decrease, which will inhibit the growth of Clostridia sp. bacteria, because the pH is acidic (Naetzold et al. (2021). The use of absorbents at different levels provides a pH value of around 4.0, which shows that the addition of absorbents helps provide the best conditions in the ensilage process. And the difference in the level of administration affects the pH level of the silage. This is because the high BK content in the type of absorbent provides an energy source that supports the activity in producing lactic acid and lowering the pH. Also, the pH value (table 2) which is lower when the amount of addition is higher indicates that the more absorbent is added, the better the conditions for odot grass silage for ensilage. Absorbent (Table 1) helps reduce the water content of odot grass, thus helping lactic acid bacteria to process and produce lactic acid from the energy provided by the absorbent, as well as good environmental conditions. Silage with bran provides the lowest average pH value compared to other types. This is in accordance with the report of Fazly (2024) showing the addition of 10% bran to silage odot grass produces an average pH of 3.69.

**3.3 Nutrient Digestibility**

Feed digestibility is important as an indicator of feed quality reviewed from the nutrient content that can be absorbed by microbes in the rumen of livestock. The higher the digestibility value, indicating that the nutrient content is digested and absorbed in large quantities, so that it can meet the nutritional needs of livestock. The results of the study obtained the best dry matter digestibility (DMD) and organic matter digestibility (OMD) values ​​of odot grass silage with the addition of 32.4% to different types of absorbents, presented in table 3.

Table 3. In Vitro Digestibility of Odot Grass Silage.

|  |  |  |
| --- | --- | --- |
| Treatment | DMD (%) | OMD (%) |
| P3S | 29.25a ± 0.49 | 18.54a ± 0.65 |
| P3D | 27.76b ± 1.32 | 21.07b ± 0.85 |
| P3P | 76.65c ± 2.33 | 62.62c ± 1.73 |

Description: P3S (Odot Grass + Husk 32.4%); P3D (Odot Grass + Rice Bran 32.4%); P3P (Odot Grass + Pollard 32.4%)

Different superscripts in the same column indicate highly significant differences (P<0.01)

The DMD and Omd values ​​of odot grass silage in the treatment of adding absorbent types with a level of 32.4% showed different variations in values ​​in each treatment as presented in table 2. The results of the analysis of variance showed that the treatment of odot grass silage with different levels of 32.4% absorbent addition had a very significant effect on DMD and OMD in vitro (P <0.01). The digestibility values ​​in P3S (husk) and P3D (rice bran) had lower digestibility values ​​than the P3P (pollard) treatment due to the high crude fiber content in the treatment. Milled husks and rice bran have a high content of crude fiber which makes the cell walls thicker and makes it difficult to break down during the ensilage process, thus slowing down nutrient degradation by rumen microbes and reducing the level of digestibility. Tillman et al. (1983) in Fajri et al. (2018) stated that SK has a major influence on the level of feed digestibility. Silage with high levels of crude fiber, especially lignin, will be more difficult to digest by rumen microbes (Alfiansyah and Hartutik 2021). On the other hand, lower crude fiber content in silage will generally be easier to digest because the cell walls of the material are more easily degraded, thus helping to increase higher digestibility levels.

Based on table 2, the DMD P3P value (76.65%) is the addition of pollard, due to better nutrient content compared to other treatments, so the P3P value is also higher than other treatments. According to Anisa et al. (2023) that the DMD value is in line with and influenced by DMD. The higher the digested DM value, the higher the digested OM value. Pollard in the study had a lower crude fiber level (10.08%) when compared to bran and husk treatments which had higher crude fiber content. In addition, pollard has a high crude protein content value (17.15), so that the digestibility level, especially the OMD obtained, can be higher. This is in accordance with Raharjo et al. (2013) that the OMD value is positively influenced by nutrient content, especially crude protein content, because protein is a component that is very easily degraded by rumen microbes. The addition of pollard to odot grass silage helps increase the nutritional value of odot grass, because as a forage, odot grass has a low crude protein content. The crude protein content in feed is important for livestock because crude protein in the rumen will undergo hydrolysis into peptides by proteolytic enzymes produced by microbes, then hydrolyzed into amino acids, then some of the amino acids are broken down into ammonia in the deamination process, which is used by microbes as a component of body protein so that many OM can be degraded (Abani et al., 2018). According to Mcdonald et al (2002) in Dwipayana et al. (2019) the factors that affect digestibility are, the composition of feed ingredients, the comparison of the composition between one feed ingredient and another, feed treatment, enzyme supplementation in feed, livestock and the level of feeding.

4. Conclusion

The addition of different types and levels of absorbents significantly affected the quality of odot grass silage in terms of nutrition content, pH value, and digestibility. Higher levels of absorbents (32.4%) resulted in nutrition content which shows that the more absorbent levels, the higher nutrition of fresh odot grass silage. Digestibility was also influenced by absorbent type, with pollard at 32.4% yielding the highest dry matter and organic matter digestibility (76.65% and 62.62%, respectively), attributed to its lower crude fiber and higher protein content, which enhance rumen microbial activity. Overall, the use of 32.4% pollard is the most effective strategy to improve silage quality by ensuring optimal fermentation, create a lowest pH value, and increasing digestibility.

Consent (where ever applicable)

All authors declare that ‘written informed consent was obtained from the patient (or other approved parties) for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal.

Ethical approval (where ever applicable)

All authors hereby declare that "Principles of laboratory animal care" (NIH publication No. 85-23, revised 1985) were followed, as well as specific national laws where applicable. All experiments have been examined and approved by the appropriate ethics committee

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