Vol 02 (02) Tahun 2023, Page 115- 123
P- ISSN: 30248442
E-ISSN: 3025-3748
Available online at: http://ojs.ummy.ac.id/index.php/janaps

The Effect Used of Local Bioactivators In Citronella Waste on The Content of Dry Matter, Organic Matter, and Crude Protein

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ABSTRACT

This research aims to determine the effect of rumen-content bioactivators in citronella waste on dry matter, organic matter, and crude protein content. Completely Randomized Design with 5 treatments with different incubation times, namely (0, 5, 10, 15, and 20 days), each treatment was repeated three times. The variables observed in this study were dry matter content, organic matter, and crude protein. This study showed that the length fermentation of citronella waste with rumen content bioactivator had no significant effect (P>0.01) on dry matter. On organic matter and crude protein, fermentation of citronella waste using rumen-content bioactivators had a hight significant effect (P<0.01). Based on the research results, it can be concluded that fermenting citronella waste using a rumen content bioactivator at a dose of 10% with long incubation times (0, 5, 10, 15, and 20 days) can increase the content of crude protein and organic material in curing for 20 days.

Keywords: Fermentation, Citronella Waste, Local Bioactivator

INTRODUCTION

Forage is the main source of animal feeding and plays a very big role for ruminants, which are for maintenance, production, and reproduction. Quality grass production in Indonesia is very low and availability is also limited due to the large amount of development and land conversion. This is because Indonesia's population growth is increasing so the need for food is also increasing. The farmer prefers to plant existing land with food, agricultural, and plantation crops rather than grass. This condition causes waste from plantations and agricultural by-products to be used as a source of fiber feed for ruminants. The citronella plant (Cymbopogon nardus) is a type of plant from the grass family that produces essential oils in Indonesia. Processing citronella by distilling will produce waste, and Usually is thrown away as truswhereas. The ruminants can utilize plantation waste, such as citronella distillation waste as a feeding.

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Processing citronella by distilling will produce waste. Usually, this citronella waste is thrown away and is no longer used, whereas it could be as ruminant feeding

Currently, the city of Solok is one of the citronella-producing areas in West Sumatra. the total area of citronella land in Solok City has reached 41.83 hectares with a total production of 128.5 tons/year and citronella distillation waste production of 4.56 tons/ha/year (Central Statistics Agency Solok, 2021), Citronella distillation waste is also supported by a fairly high protein content so it is very good as animal feed. The nutritional content of citronella waste based on dry matter was 5.72% crude protein, 34% crude fiber, and 2.39% fat (Permana, 2020).

The Sukamto et al., (2012), citronella waste has better quality than rice straw because it has a higher protein content. Sukamto et al., (2011) reported that the protein content of citronella distillation waste was 7.00%, higher than rice straw protein which was only 3.93%. Other nutritional content in citronella distillation waste is fat 2.3%, Gross Energy (GE) 3,353.00 (Kcal/GE/kg), crude fiber 25.73%, calcium 0.35%, phosphorus 0.14%, and ash content 7.91%. The crude fiber is better (lower), namely 25.73%, compared to elephant grass (11.7%) and straw (32.99%) (Research Institute for Medicinal and Aromatic Plants 2011). The weakness in using citronella distillation waste as a substitute for forage (grass) is hampered by several factors, including freshly distilled citronella waste still contains quite a high water content, so it rots and molds more easily. Apart from that, it still contains 0.1 ml / 10 grams of essential oil which has antimicrobial properties which can disrupt the work of rumen microbes (Usmiati et al., 2015).

Another weakness of citronella distillation waste is its high lignin content of 11.1% (Ortiz, 1987). The presence of high levels of lignin in feed greatly affects the digestibility of cellulose and hemicellulose, especially due to the formation of complex bonds between lignocellulose and lignohemicellulose. This high lignin content is one of the weaknesses in its use as animal feed as a replacement for grass because of its low level of digestibility. Increasing the digestibility of animal feeding processing technologies by physics, chemistry, and biology. One of them was fermentation using bio activator based on rumen contents. Fermentation is a biological process by microorganisms to hydrolyze low-quality materials so that their nutritional value increases, both aerobically and anaerobically. Fermentation is a technology to improve the quality of

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waste products, because of the involvement of microorganisms in degrading crude fiber, reducing lignin levels and anti-nutritional compounds so that the digestibility value of feed from waste can increase (Wina, 2005). The fermentation process can increase the availability of food substances such as protein and metabolic energy and can break down complex components to be simpler (Zakariah., 2012). The main factor that must be considered in the length of fermentation is the incubation period, the growth of microorganisms with the length of time used for the metabolic concentration increases (Montesqrit et al, 2022). The rumen fluid of cows is one of the slaughterhouse wastes that has not been utilized optimally and some are simply thrown away, causing environmental pollution. This waste has great potential if used as animal feed because the liquid contents of the cow's rumen, apart from being an undigested feed material, also contain rumen organisms which are a source of vitamin B (Arora, 1989). Astuti (2012) used local microorganism sources from several wasted materials (rumen contents, banana peels, and vegetable waste) as inoculum to ferment banana peels and optimal fermentation results were obtained from rumen contents of local microorganism sources. It is hoped that in the future this fermentation technology using local microorganisms can improve the quality of sustainable local feed and replace commercial ingredients such as tempeh yeast and EM4 (Astuti et al., 2015). The research by Astuti et al. (2022) used crude enzymes derived from rumen contents at a dose of 10% in palm fronds containing 94.55% Dry Matter, 77.65% Organic Matter, and 10.50% Crude Protein for a long time. best incubation at 7 days.

MATERIALS AND METHODS

This research was an experimental method using a Completely Randomized Design with 5 treatments and 3 replications. Citronella waste used which was fermented by rumen content bioactivator at a dose of 10%, with different length incubation :

P0 = 0-day
P1 = 5 days
P2 = 10 days
P3 = 15 days
P4 = 20 days

Process of produced Bioactivator based on Rumen content (Astuti et al.; 2022)

1. The contents rumen of cows are taken from the Solok city abattoir

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2. For as much as 500 grams of rumen content, add 100 grams of chopped palm leaves and fronds, then add 250 ml of molasses, and 2000 ml of tofu soaking water mixed into the jar container.
3. Make a hole in the lid of the jar and connect it with a small hose to the bottle containing distilled water.
4. The jar is wrapped with duct tape to prevent air from entering.
5. Then incubation process for 7 days.

Fermentation Process of Citronella Waste

1. Citronella waste was ground using a chopper machine to be a smooth sample
2. Then put it in a plastic bag and mix it with a rumen bioactivator solution of 10% of the sample material, then stir until evenly distributed.
4. After that, compaction (air compression) is carried out, and incubation for 0, 5, 10, 15, and 20 days.
5. The Samples were opened according to the day of treatment. it is dried in an oven at a temperature of 60°C and crushed for laboratory testing.

The parameters measured were the dry matter, organic matter, and crude protein content of citronella waste, carried out based on proximate analysis.

If the treatment shows a highly significant effect ($P<0.05$), it will be further tested by Duncan's New Multiple Range Test (DNMRT) (Steel and Torrie, 1993)

RESULTS AND DISCUSSION

The data effect of fermentation of citronella waste by local bio activator based on rumen content on the content of dry matter, organic matter, and crude protein is shown in Table 1.

Table 1. The Average Dry Matter, Organic Matter, and Crude Protein Content of Citronella Waste Fermented By Local Bio Activator (%).

reatments	dry matter	organic matter	crude protein
P0	48,88	86,12^{d}	5,40^{e}
P1	47,77	87,22^{c}	6,42^{d}
P2	46,67	88,33^{b}	7,08^{c}
P3	46,08	88,92^{a}	8,89^{b}
P4	45,22	89,78^{a}	10,7^{a}

Note: Superscripts (a, b, c) in the same column indicate the hight significant effects ($P<0.01$). P0 = 0 day, P1= 5 days, P2= 10 days, P3= 15 day, P4= 20 day

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Dry Matter Content

The results of variance analysis showed that fermentation of citronella waste using a 10% rumen content bioactivator with different length incubation (0, 5, 10, 15, and 20 days) showed no significant effect (P>0.05) on the dry material content of citronella waste. In Table 1, it can be seen that the dry matter content of citronella which was added with 10% bioactivator in the rumen contents without incubation (0 days) was 48.88 and after incubation for 5, 10, 15, and 20 days, the dry matter content decreased to 47.77, 46.57, 46.08, and 45.22%. This shows that the incubation process using rumen-content bioactivators causes an increase in the water content of citronella waste.

The fermentation process can decrease the dry matter content. This is because of the use of nutrients from the substrate by microbes as a source of carbon, nitrogen, and minerals, as well as the release of CO2 and energy in the form of heat which evaporates with water particles, that are formed from the catabolism process which breaks down complex compounds into simpler materials (Zumael, 2009).

The Kurnianingtyas et al., (2012), dry matter reduction can occur in the aerobic and anaerobic stages. The decrease in dry matter in the aerobic stage occurs because the respiration process on fermented, so that glucose which is a dry matter fraction will be converted into CO2, H2O, and heat. The decrease in the anaerobic stage occurs because glucose is converted into ethanol and CO2 by microorganisms. The decrease in dry matter is because of an increase in water content which causes more nutrients to break down, thereby reducing dry matter levels. According to Fardiaz (1989), the fermentation process occurs through a series of biochemical reactions that change the dry material of the substrate into energy (heat), water molecules (H_2O), and CO_2. This process causes a decrease in the dry material content of the substrate used.

Organic Matter Content

The analysis of variance results showed that the length fermentation for citronella waste using a local bio activator at a dose of 10% with different length incubation (0, 5, 10, 15, and 20 days) showed a high significant effect (P<0.01) on the organic matter content of citronella waste. This is because of the different lengths of incubation for citronella waste. DNMRT further tests showed that the incubation time for citronella waste for 0, 5, 10, 15, and 20 days respectively showed a very significant difference (P<0.01). The

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data in Table 1 shows that the longer the incubation time, the more the organic material content of citronella waste increases. This is due to the activity of microorganisms contained in the rumen content bioactivators. Astuti et al (2017) stated that there is a process of breaking down the contents of the fermentation substrate which makes it easier for existing microorganisms to digest organic matter and release metabolic products in the form of sugar, alcohol, and amino acids by micro-service activities resulting in changes in nutritional value. Research by Astuti et al (2020) found that the total number of colonies in local bioactivators from cow rumen was 554,83.10.^{10} cfu/w. This is the same opinion of Wilkinson (1988) who states that the fermentation process carried out by microorganisms causes changes in nutritional value, namely carbohydrates are converted into alcohol, organic acids, water, and CO_2. The success of the fermentation process is determined by the ability of microbes to adapt to the substrate to be used as nutrition for microbial growth and development (Zakaria et al., 2013).

Effect of fermentation of citronella waste with Local Bioactivator on crude protein content

The results of the analysis of variance showed that fermentation of citronella waste with a 10% rumen content bioactivator showed a very significantly different effect ($P<0.01$) on the crude protein content of citronella waste. Further tests with DNMRT showed significantly different effects at each incubation period (0, 5, 10, 15, 20 days). In Table 1, it can be seen that the longer the incubation period is, the greater the crude protein content of citronella waste increases.

The longer the incubation time will increase the growth of the bioactivator population in the rumen content which will result in the loss of a certain amount of water bound in the citronella waste and the crude protein of the fermented citronella waste will increase. This is because in the fermentation process, microbial growth occurs and several extracellular enzymes and proteins produced by mold metabolism result in an increase in crude protein levels. The increase in crude protein content is because of the work of microbes during their growth. The length Fermentation process causes the crude protein to increase (Arifin, 2003). The more microbial cells that grow, the protein content in the solid medium fermentation product will increase (Surkayana et al. 2010). The microorganisms produce the enzyme in their activity, and it is a protein. Noferdiman et al. (2008) said that as the number of

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microbes producing the enzymes, that is proteins, so the presence of enzymes will affect the crude protein content of feed ingredients. Mirnawati (2013) stated that the longer the fermentation time given, the more microbes will grow. The high increase in crude protein in the P4 treatment was due to the longer fermentation time of citronella waste using a rumen content bioactivator, meaning that the fermentation process would be better as a result, the protein would provide a fairly high protein contribution compared to other treatments.

CONCLUSION

Based on the results of research, it can be concluded that different lengths of incubation (0, 5, 10, 15, and 20 days) on citronella waste by local bio activator based on a rumen content at a dose of 10% gave a high significant effect (P< 0.01) on the content of, organic matter, and crude protein. The best length of incubation on the 20 days.

ACKNOWLEDGMENTS

Thank you to the Ministry of Education, Culture, Research, and Technology through the Director of Research, Technology, and Community Service for providing funding for National Competitive Grant research, Fundamental Scheme. with contract number Number 186/E5/PG.02.00.PL/2023 and Agreement / Contract Number 004/LL10/PG.AK/2023, 06.1/LP3M-UMMY/Research Contract/2023

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