
PHYSICAL QUALITY OF RICE STRAW AMMONIA USING DIFFERENT LEVELS OF UREA

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Abstract

This research aims to determine the effect of the use of urea with different levels on the physical quality of rice straw ammonia. The method used is a complete random design (CRD). The treatment consisted of 5 treatments with three replicates, namely P0: Urea 0%; P1: Urea 2%; P2: Urea 4%; P3: urea 6% and P4: Urea 8%. The parameters observed were physical quality (color, smell, texture) and pH. The results showed that the difference in the level of urea use had a real effect ($P < 0.05$) on all parameters, namely color, smell, texture and pH. The treatment that provides the best physical quality is the P2 treatment with a urea level of 4%.

Keywords: Ammonia, Physical quality, Rice straw, Urea,

INTRODUCTION

An inhibiting factor in the provision of forage for livestock is the season. In the rainy season, forage production is very abundant, while in the dry season forage production is greatly reduced, so the importance of the use of agricultural waste by livestock cannot be ignored. Rice straw is one of the agricultural wastes that is found in abundant quantities and is easy to obtain to be used as livestock feed. The characteristics of rice straw are characterized by low nitrogen, calcium, and phosphorus content; while the crude fiber content is high.

Lignin is a factor that affects the low digestibility of straw in general, while in rice straw the low digestibility is caused by the high silica content. Lignification and silification together affect the low digestibility of rice straw (Van Houtert, 1981). Efforts to increase the nutritional value and digestibility of rice straw can be done by chemical treatment (Ammonia) and biological treatment (Probiotic) or a combination thereof.

Ammonia is one of the chemical treatments that has the principle of urea as a source of ammonia which aims to dissolve silicate minerals, hydrolyze lignocellulose and lignohemicellulose bonds, improve digestibility, increase crude protein content, and suppress fungal growth (Setyono *et al.*, 1997). The principle of ammonia according to Hanafi (2008) is a process of overhauling from a hard structure to a soft structure with the help of ammonia source chemicals or NH_3 in order to increase the digestibility and nitrogen content (protein) of feed materials.

Through ammonia technology, the fibers of rice straw become soft (swollen process) so that the fibers become easier to be infiltrated by rumen microbes and then easily degraded. Therefore, the increase in digestibility of rice straw is not only through the fermentation process by microbes but also due to the process of weak alkaline hydrolysis (ammonia). Through the fermentation process of rice straw with EM4, urea is also added to it so that during the ripening process there is also an ammonia process (Akmal *et al.*, 2004). In the ammonia process, ammonia plays a role in hydrolyzing cellulose lignin bonds, destroying hemicellulose lignin bonds and expanding cellulose fibers so as to

facilitate the penetration of cellulase enzymes and increase nitrogen levels so that the crude protein content increases (Komar, 1984). The use of urea levels in the ammonia process needs to be considered. This is because the quality of rice straw ammonia is influenced by the amount of urea added to the ammonia process. In addition, of excess ammonia can also harm the health of livestock. Therefore, it is necessary to study the appropriate level of urea use in the manufacture of rice straw ammonia.

LITERATURE REVIEW

Ammonia is one of the methods of chemical processing of feed by adding alkali and acid that are fermented aerobically or anaerobically (Pigden and Bender, 1978). The purpose of the ammonia process according to Setyono *et al.*, (2009) is to dissolve silicate minerals, hydrolyze lignocellulose and lignohemicellulose bonds, improve digestibility, increase crude protein content, and suppress fungal growth. Tonysapi (2013) stated that the purpose of ammonia is to unravel the very strong fiber bonds on the straw wall, so that cellulose and hemicellulose which have a very high energy value can be digested and absorbed by the digestion of ruminant livestock.

The three sources of ammonia that can be used in the ammonia process are NH_3 in the form of liquid gas, NH_4OH in the form of a solution, and urea or $(\text{NH}_2)_2\text{CO}$ in solid form. The recommended source of ammonia to use is urea because it is cheaper, easy to use, and less toxic to cause. This is in accordance with the criteria for chemical substances for feed processing put forward by Owen *et al.*, (1984), which must be effective in increasing digestibility and/or consumption, cheap and easy to obtain locally, not leaving toxic residues in livestock, and feces and urine excreted do not cause pollution to the environment. The material must also be easy to handle and not harmful to the farmer.

According to Sundstol and Coxworth (1984), the main principle of ammonia work is to damage or loosen lignocellulosic bonds and increase the solubility of hemicellulose so that it is easily digested by rumen microorganisms. Ammonia also increases nitrogen content through the fixation of nitrogen into the tissues of feed cells, which is then calculated as protein and functions as a preservative in feed ingredients.

RESEARCH METHOD

This research was conducted at the Teaching Farm of the Department of Animal Husbandry, Pangkep State Agricultural Polytechnic, Pangkep Regency. The materials used in this study are 15 kg rice straw, 10,5 liter water and urea according to the treatment. This study consisted of 5 treatments with 3 replicates using a complete randomized design (CRD) with the following treatment arrangements: P0: Urea 0%;

P1: Urea 2%;

P2: Urea 4%;

P3: urea 6%

P4: Urea 8%

Rice straw is chopped to a size of 3-5 cm. After that, mix 70% water and urea according to the treatment. After mixing and homogeneously, it is put into a jar until it is solid, then it is ammonized for 21 days. Furthermore, observations were made on color, aroma, texture parameters, inspection of fungal contamination and pH checking. The physical quality test was carried out by the panelist test method using 10 people. The panelists used were livestock students who already understood the

quality characteristics of amoniasi products. pH measurement uses a ph meter while other parameters are tested based on fermentation scoring standards according to Table 1.

Table 1 Ammonia scoring standards

Parameters	Characteristic	Score
Colur	Light yellow	0,0-1,0
	Yellow	1,1-2,0
	Light brown	2,1-3,0
	Chocolate	3,1-4,0
smell	Ammonia is very strong	0,0-1,0
	Ammonia increases	1,1-2,0
	Slight ammonia smell	2,1-3,0
	There is no smell of ammonia	3,1-4,0
Texture	Very rude	0,0-1,0
	Rough	1,1-2,0
	Fine	2,1-3,0
	Very Smooth	3,1-4,0

Caption: Score criteria: 0.0-1.0 is not good; 1.1-2.0 is good enough; 2.1-3.0 is good; 3.1-4.0 is very good.

The data obtained was analyzed using a variety fingerprint or analysis of variance calculation (ANOVA). All data analysis uses the SPSS version 24 application. If the results of the fingerprint analysis show a real influence, a further test is carried out by Duncan's Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

The physical quality and pH value of ammonia straw rice with the use of Urea at different levels are presented in Table 2.

Table 2 Physical quality and pH value of ammonia rice straw with the use of EM4 at different levels

Treatment	Parameters				
	P0	P1	P2	P3	P4
pH	7,45±0,89 ^b	6,62±0,03 ^a	6,80±0,26 ^a	6,70±0,87 ^a	6,76±0,09 ^a
Colur	2,18±0,13 ^a	3,00±0,01 ^{bc}	3,08±0,14 ^c	3,03±0,29 ^{bc}	2,71±0,18 ^b
Smell	3,34±0,32 ^c	1,00±0,01 ^a	3,93±0,12 ^d	1,57±0,24 ^b	3,38±0,03 ^c
Texture	2,44±0,36 ^b	2,52±0,10 ^b	3,12±0,33 ^c	2,33±0,03 ^b	1,79±0,60 ^a

Caption: Different superscripts on the same line show a real influence ($P < 0.05$). urea usage level (P0: EM4 0%; P1: urea 2%; P1: urea 4%; P2: urea 6%; P3: urea 8%)

Based on Table 2, the variety analysis showed that the treatment of different urea levels in rice straw ammonia had a real effect ($P < 0.05$) on pH, color, odor and texture. The results of further tests using duncan were found that the P2 treatment showed the best results. The pH value of rice straw ammonia products in this study shows a difference between P0 and other treatments. Goenadi (2017), stated that the increased pH can be caused by urea being hydrolyzed by bacteria so that it produces ammonia and carbon dioxide which are then released to form an alkaline environment. The ammonia released is the result of the process of deamination of the protein substrate in the medium. Changes in pH during the ammonia process are very important to observe because pH is one of the factors that live for microbes. The best pH in ammonia products is 7-8.

The highest color score in the P2 treatment was brown. The brown discoloration of the rice straw indicates that ammonia is going perfectly. According to Ditjennak (2011) a good ammonia

criterion is brownish color, ammonia straw is softer than the original or original straw. Then the color produced after being fermented for 29 days changes color from the previous yellow color to brownish-yellow. Zulkarnaini (2011) added that the perfect ammonia process is characterized by the ammonia color of the straw husk is dark brown, this indicates a reaction from alkali.

The P2 treatment produced the highest odor assessment score. The treatment of urea addition causes a characteristic odor on rice straw. Ammonia produces a distinctive aroma, namely the smell of ammonia (Ilham et al., 2018). The texture of ammonia rice straw is also best in the P2 treatment, which is very fine. The soft, soft and smooth texture of ammonia rice straw is due to the bonds of lignin, cellulose, and silica on the cell wall of rice straw. The longer the ammonia process, the softer and softer the texture of the ammonia rice straw will be so that it is easier for rumen microbes to digest.

The addition of urea at the level of 4% has been proven to be sufficient to produce rice straw ammonia products with the best physical characteristics. The addition of urea at the level of 4% is able to stretch the lignin bonds so that it produces optimal pH, brown color, characteristic ammonia smell and very smooth texture. Tonysapi (2013) stated that the purpose of ammonia is to unravel the very strong fiber bonds on the straw wall, so that cellulose and hemicellulose which have a very high energy value can be digested and absorbed by the digestion of ruminant livestock. According to Shieddiqi (2013), the rice straw to be ammoniated must meet several criteria, namely the straw must be in dry condition, must not be submerged in rice field water or rainwater, and must be in good condition (not rotten or damaged).

CONCLUSION

The conclusion of this study is that the treatment that provides the best physical quality in rice straw ammonia is P2 treatment with an urea level of 4%.

ACKNOWLEDGEMENT

The author would like to express his gratitude to the Department of Animal Husbandry of the Pangkep State Agricultural Polytechnic for the facilities, facilities and infrastructure provided during the research.

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