32 THE NUTRIENTS QUALITY OF FIBER PALM WITH AMMONIATION-FERMENTATION

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Abstract. The research was carried out concerning the nutrition quality of Palm fiber through ammoniation-fermentation process. The experiment was arranged using Randomized Complete Design with 5 treatments and 3 replications. The inoculum was starbio and molasses in 1:1 ratio with 21 days fermentation. Treatments consisted of control (R0), 2% urea (R1), 2% urea + 2% starbio (R2), 2% urea + 4% starbio (R3), and 2% urea + 6% starbio (R4). The results showed that ammoniation-fermentation treatment significantly increased ($P<0.01$) crude protein, crude fat, and ash contents of palm fibers, but it did not significantly increased ADF, NDF, cellulose, and lignin contents. Conclusion of this research was the ammoniation-fermentation treatment of 2% urea + 4% starbio increased crude protein and ash contents and lowered fat content. In addition, ADF, NDF, and lignin contents from cellulose were relatively similar to the control.

Keyword: Nutrients quality, palm fiber, ammoniation-fermentation

INTRODUCTION

Palm fiber, which is by product of oil palm industry, has potential as a source of ruminant feed because its availability is abundant throughout the year. However, palm fiber only reaches 35-45% digestibility level and contains 5% crude protein. Ruminant feed requires at least 50-55% digestibility level and 8% crude protein content.

Optimizing utilization of palm fiber as ruminant feed can be improved through chemical, physical, and biological treatments. Based on the characteristics of palm fiber with low protein and digestibility, the treatment should be reduced both of these constraints. Treatment provided must be able to increase the protein content and digestibility palm fiber. Improved quality of palm-fiber technology is most likely applied with ammoniation-fermentation techniques.

Ammoniation is one form chemical treatment (using urea) that many have done to improve nutritional value and digestibility of plantation by product with high in fiber content. Ammoniation is both chemical and alkalis treatment which is can dissolve hemiselulosa, lignin and silica, saponification acid uronat and esters acetic acid, neutralize nitric acid free and provide content lignin cell wall. The descent crystalinity cellulose will facilitate penetration of enzyme cellulose of rumen microbe (Van Soest 2006). Ammonia used can be gas, aqueous solution or ammonia solution of urea. The molecular formula of

Urea is CO $(NH_2)_2$, which is a cheap source of nitrogen, hygroscopic, crystalline-shaped solid and easily soluble in water. Urea is used as a source of ammonia because it is alkaline and do not cause environmental pollution due to missing and can easily evaporate fixation by plants and microbial. The process of ammoniasi a influenced materials by a number of factors among others a dose of ammonia, environmental temperature, long storage, and moisture content of materials.

Fermentation is a process that happens through the work of microorganisms or enzymes to convert the organic complex material as protein, fat and carbohydrate molecules into simple ones. Fermentation using starbio can increase the digestability involved in the degradation of crude fiber content on the Palm fiber. Starbio is a collection of microorganisms (probiotic microbes, cellulolytic, lignolitic, lipolitic, aminolitic) that are able to metabolize the complex organic material into simple organic material (Anonimous 2009). Added Winarno (1980) States that fermented feed materials change containing protein, fat and carbohydrate that are difficult to digest becomes easy to digest and produce aroma and flavor that is typical. Based on the above research needs to be done influences the quality of nutrition through the Palm fiber technology ammoniation-fermentation.

MATERIALS AND METHODS

Materials

Materials used in this research are Palm fiber obtained from PT. Sampurna Agro, urea [CO (NH2) 2] as a source of ammonia to process ammoniation, molasses and inoculum solution for starbio for fermentation process as well as chemicals for analysis of proksimat and van soest.

Instrument

The equipment consists of a bucket, a pair of scissors, a knife, a plastic bag, scales, analytical laboratory equipment such as porcelain, glass bowls, spatula, beaker oven, furnace, glass paper filter and G3, etc.

Methods

The process of Palm fibers ammoniation with urea levels 2% was held for 21 days as instructed, Riswandi *et al*. (2009). The manufacture of fermented Palm fiber for 21 days is done with a mixture of Palm fiber material, among others, ammoniation and inoculum solution. Manufacture of inoculum is starbio: molasses: a comparison of water

i.e. 1:1:20 in accordance with directive Zainuddin *et al*. (1994). Measurement of proksimat based on the AOAC (1990) and fiber based on Van Soet (1983)

Designs

The design used in this study is a Randomized Design with Complete with 5 treatments and 4 replications. Treatment consisted of:

1. Control
2. 2% Urea
3. 2%urea dan 2 % starbio
4. 2%urea dan 4 % starbio
5. 2%urea dan 6 % starbio

Based on analysis of a range of Data processed in accordance with the draft which used multiple range test and continued Duncan (Steel and Torrie 1983).

Variables

Variables observed in this study is, ash, crude protein, crude fat, crude fiber, cellulose, ADF, NDF, and lignin.

RESULTS AND DISCUSSION

Influence ammoniation and ammoniation fermentation by using urea and Starbio the nutritional quality palm fibers are presented in Table 1.

Table 1. Influence ammoniation and ammoniation-fermentation with urea and starbio in chemical composition palm fibers

Treatment	Crude Protein	Crudefat	Ash	NDF	ADF	cellulosa	Lignin
R0	5.93^{a}	8.65^{d}	4.75^{a}	76.34	69.39	24.17	42.52
R1	8.19^{b}	6.93^{bc}	5.17^{a}	81.26	69.31	28.96	37.26
R2	7.72^{b}	7.84^{c}	5.11^{a}	80.93	69.13	30.12	35.52
R3	8.39^{b}	6.23^{ab}	7.12^{b}	77.84	68.57	31.65	32.55
R4	6.95^{a}	5.63^{a}	6.84^{b}	79.22	62.32	33.67	21.85

Description: R0 (No treament/control), R1(2% urea), R2 (2% urea + 2% Starbio), R3 (2% urea + 4% starbio), R4 (2% urea + 6% starbio). Superscript in different columns of the same shows significantly different(P<0,01)

Crude Protein Content

The result analysis showed that treatment of ammoniation and ammoniation-fermentation using urea and starbio significantly different (P< 0.01) of crude protein

content in fiber palm. R0 treatment (control) is not different with treatment R4 (2% Urea+ 6% Starbio), but treatment differs markedly R0 and R4 treatment R1 (2% Urea), R2 (2% urea+ 2% starbio), R3 (2% urea + 4% starbio). This shows that treatment with ammoniation and ammoniation-fermentation can increase crude protein and fiber content, although in relatively equal treatment on R4 with treatment but there is a trend of increasing R0 protein content of Palm fiber. It is influenced by the donation of crude proteins from microbes used in fermentation starbio fiber palm and N from ammoniation. Ammonia can cause changes in the composition and structure of cell wall, dilute the bonds between lignin and cellulose and hemicellulose, makes it easier digestion by cellulase rumen microorganisms. Ammonia will be absorbed and bound with a methyl group from the feed material, ammonium acetate to form salts that are ultimately accounting as protein ingredients (Anonimous 2012). Next Nining (2011) declaring that the level of granting ammonia optimal for ammoniation is 3-5% (equivalent to urea 5.3-8.8%) of dry substances. The provision of ammonia less than 3 %, did not influence his digestibility so only serves as a preservative. The provision of ammonia more than 5 % will be wasted because of a not capable of absorbing ammonia. Ammoniation with urea can increase the digestion after 21 days fermentation. Starbio is a group of microorganisms lignolitik, selulolitik, lipolitik, and symbiotic nitrogen fixation bacteria non protein-containing 10.42% (Anonimous 2009). A new Protein in feed by fermentation forage preservation is composed of a merger between N free of bacteria and the rest of the carcass fatty acid volatile who had lost ion O, N and H (Sandi *et al.* 2010). The next Harfiah (2010) report that the addition of urea can also increase total N feed on material so that support an increase in crude protein in feed materials. Research results-Gomez vazquez *et al.* (2011) suggests the use of fermentation and urea can increase crude protein content sugarcane.

Crude Fat Content

The result analysis shows that treatment ammoniation and ammoniation-fermentation by the use of urea and starbio significantly different ($P< 0.01$) crude fat content of fiber palm. R0 treatment (control) different with R1 treatment (2% urea), R2 (2%urea+ 2% starbio), R3 (2% + 4% of starbio), R4 (2% +6% starbio), as well as R1 and R2 with R4 treatment. R1 treatment no different with R2as well as between R3 treatment withR4 and R1with R3 treatment. A fat content the highest on treatment control (R0) as that of 8.65 %, the on treatment ammoniation 2 % urea + 6 % starbio (R4) as that of 5.63%. It showed that with treatment ammoniation-fermentation capable of lowering a fat content of fiber palm. It is caused by microbial activities during fermentation with additional starbio. The fat contained in fiber palms relegation suffered by bacteria lipolitik derived from starbio (Gunawan and Sundari 2007). The research Himawan (2006) indicating that ammoniation with dose urea different decreased a crude fat content of Waste brown. Added Nelson and Suparjo (2011) reported that fermentation process might lower a fat content of pod cocoa.

Ash Content

The analysis result shows that treatment ammoniation and ammoniation-fermentation by the use of urea and starbio significantly different (P< 0.01) ash content of palm fiber. Treatments of R0 (control), R1 (2% Urea), and R2 (2% urea + 4% starbio) were different with R3 (2% urea+ 4% starbio) and R4 (2% urea + 6% starbio). The content of the ashes of the highest treatment R3 of 7.12 %, while the lowest in treatment R0 of 4.75 %. It showed that with the increase the addition of starbio in the process of ammoniation-fermentation increase ash content of palm fiber. It is caused by during the process ammonia-fermentation there are changes in organic matter (Haddadin *et al*. 2009). Pitriyani (2006) reported that ammoniation withurea and the length of different storage on the pod soybean can increase the levels of ashes.

Crude Fiber

The result analysis shows that ammoniation treatment and ammoniation-fermentation by the use of urea and starbio were not significantly different to NDF, ADF cellulose, and lignin contents of palm fiber. The addition of urea and ammoniation-starbio through fermentation lowered the levels of ADF and lignin, and increased levels of NDF and cellulose of palm fiber. Declined and increased levels of these fibers were affected by problem solving as a result of the addition of urea lingo selulosa and activity microorganisms found in starbio containing bacteria and cellulolitic lignolitic (Anon 1994). The ammonia produced in the process of ammoniation caused a change the composition and structure of cell wall, which serves to liberate the bonds between lignin and cellulose and hemicellulose. The chemical reaction that occurs (by undercuts liaison hydrogen) network expansion and increase flexibility to facilitate the penetration of cell wall (tunneling) by the enzyme cellulose produced by microorganisms (Van Soest 2006)

CONCLUSION

This research concludes that ammoniation of palm fiber with 2 % urea + 4 % starbio increased crude protein and ash contents, and lowered crude fat content. In addition, NDF, ADF, cellulose, and lignin contents were relatively stable.

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