

Evaluating the Digestibility of Ammonia Fermented (*Amofer*) Corn Cob Using Different Levels of M21 Decomposer and Urea (In Vitro Study)

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Abstract. This research aimed to evaluate the addition of M21 Decomposer (MD) and urea (U) on the Dry matter digestibility (DMD) and Organic matter digestibility (OMD) in vitro. There were five treatments and five replicates. The treatments in this study were the addition of MD and U at different levels. namely R₀ = Corn cob without amofer/control; R₁ = Amofer Corn cob plus 0.04% MD+3% U; R₂ = Amofer Corn cob plus 0.06% MD+3% U; R₃ = Amofer Corn cob plus 0.04% MD+5% U; and R₄ = Amofer Corn cob plus 0.06% MD+5% U. The obtained data were subjected to Analysis of Variance and continued by an Orthogonal Contrast. The result showed that the treatments significantly affected ($P < 0.05$) both DMD and OMD digestibility. The digestibility of amofer corncob was higher than the non-amofer that exhibited $17.982 \pm 2.4409\%$ DMD and $26.024 \pm 3.009\%$ OMD. The highest DMD and OMD digestibility was observed in R₄. i.e.. $24.655 \pm 4.858\%$ and $34.276 \pm 5.176\%$. respectively. In conclusion. the best level in the incorporating MD and U is at MD 0.06% and U 5% could improve DMD by 6.673% and OMD by 8.252%.

Keywords: amofer, corn cob, digestibility, dry matter, organic matter

Abstrak. Tujuan dari penelitian ini adalah untuk mengevaluasi level penambahan M21 Dekomposer (MD) dan urea (U) terhadap Kecernaan Bahan Kering (KBK) dan Kecernaan Bahan Organik (KBO) secara in vitro. Terdapat 5 perlakuan dengan masing-masing perlakuan diulang sebanyak 5 kali. Perlakuan dalam penelitian ini adalah penambahan MD dan U pada level yang berbeda (R₀ = Janggal Jagung tanpa amofer/kontrol; R₁ = Amofer Janggal Jagung meggunakan 0,04% MD+3% U; R₂ = Amofer Janggal Jagung menggunakan 0,06% MD+3% U; R₃ = Amofer Janggal Jagung menggunakan 0,04% MD+5% U; dan R₄ = Amofer Janggal Jagung menggunakan 0,06% MD+5% U). Data yang diperoleh kemudian di Analisis Variansi (ANAVA) dan dillanjutkan dengan Uji Orthogonal Kontras. Hasil penellitian menunjukkan bahwa perlakuan berpengaruh nyata ($P < 0,05$) terhadap kecernaan baik KBK maupun KBO. Hasil menunjukkan bahwa kecernaan pada janggal jagung yang diamofer lebih tinggi dibanding janggal jagung tanpa amofer dimana KBK janggal jagung tanpa amofer hanya sebesar $17,982 \pm 2,4409\%$ dan KBO sebesar $26,024 \pm 3,009\%$. Kecernaan paling tinggi baik KBK maupun KBO diperoleh pada amofer janggal jagung perlakuan R₄ yaitu kecernaan bahan kering sebesar $24,655 \pm 4,858\%$ dan kecernaan bahan organik sebesar $34,276 \pm 5,176\%$. Kesimpulannya adalah, level terbaik terdapat pada kombinasi MD 0,06% dan Urea 5% yang mampu meningkatkan KBK sebesar 6,673% dan KBO sebesar 8,252%.

Kata kunci: amofer, janggal jagung, kecernaan, bahan kering, bahan organik

Introduction

Corn cob is a part of corn plant that becomes an agricultural waste. Meanwhile, corn cob is the potential feed for livestock, especially ruminants. Cornfields cover an area of 52.8054 ha across Central Java province, producing 3,212,391 tons in 2015 (Central Java BPS, 2018) and keeps increasing in the past five years. As a result, corn cobs are vastly available for feed, but the quality is poor. Low digestibility and protein content contribute to the low-quality corn cob, so it is crucial to

perform advanced treatments to the cobs before feeding.

Ammoniation and fermentation are two combined techniques in feed processing that could improve the quality of corn cob as animal feed. Ammonia works in detaching lignin-cellulose bound and providing N source for the growth of microbe. Meanwhile, fermentation improves digestibility and crude protein in the corn cob (Prastyawan et al., 2012). Ammoniation may use urea as the source of N,

and fermentation may use a commercial starter (M21 Decomposer) as the source of microbe.

However, the level of use of M21 Decomposer and urea in the amofer process still needs to be evaluated to determine its effect on digestibility. This study aims to evaluate the additional level of M21 Decomposer and urea and their effect on the digestibility of both dry matter and organic matter.

Materials and Methods

The materials consisted of (1) corn cobs from harvested and chopped hybrid yellow corn; (2) M21 Decomposer containing various microbes including *Pseudomonas*, *Actinomyces*, *Lactobacillus*, *Acetobacter*, *Trichoderma* and *Rhizobium*; (3) N content in urea; and (4) water. The study conducted an in vitro experiment using a method by Tilley and Terry (1963) in a Completely Randomized Design, assigning five treatments, and five replicates. The treatments were R0 = Corn cob without amofer/control; R1 = Amofer Corn cob plus 0.04% MD + 3% U; R2 = Amofer Corn cob plus 0.06% MD + 3% U; R3 = Amofer Corn cob plus 0.04% MD + 5% U; and R4 = Amofer Corn cob plus 0.06% MD + 5% U. The measured variables included Dry matter digestibility (DMD) and Organic matter digestibility (OMD). The obtained data were subjected to analysis of variance (ANOVA) to evaluate the effect of treatments on the measured variables, continued by an Orthogonal Contrast test.

Results and Discussion

Dry matter digestibility and Organic matter digestibility (Table 1) showed that the ammonia fermentation (amofer) using M21 Decomposer and urea on the corn cobs could increase the DMD and OMD. The data illustrated that DMD and OMD of amofer corn cobs in the treatment

R1, R2, R3, and R4 were higher ($P < 0.05$) than those of control/without amofer treatment (R0). Furthermore, the analysis showed that the highest DMD and OMD were obtained from the amofer corn cobs in treatments R4 with an additional 0.06% M21 Decomposer and 5% urea. Meanwhile, DMD and OMD across treatments R1, R2, and R3 were not significantly different ($P > 0.05$). It demonstrates that incorporating M21 Decomposer and Urea could increase DMD and OMD.

The effect of treatments on dry matter digestibility

The result of DMD analysis showed that treatment R0 was significantly different ($P < 0.05$) from R1, R2, R3, and R4. Incorporating M21 Decomposer and Urea could increase the corn cobs DMD due to the loose lignin-cellulose bound as a result of the ammoniation and fermentation process that pre-digest the complex compounds outside the rumen with the help of microorganism in the M21 Decomposer. It was in line with Prastyawan et al. (2012) that the DMD of corn cobs treated with ammonia fermentation would increase as the level of starter improved.

The result of DMD analysis on treatment R4 showed a highly significant difference ($P < 0.01$) from that of treatment R3. Dry matter digestibility of the R₄ treatment increased by 6.673% compared to untreated corn cobs (R₀). Dry matter digestibility represents the total digestible nutrition by the ruminal microbes. Therefore, the higher the DMD, the more nutrients digested by the ruminal microbe. The highest additional level of M21 Decomposer and urea was in R4 of all treatments. As a result, R4 had the highest digestibility of amofer corn cobs. Yulistiani et al. (2011) stated that incorporating 3% urea into the corn cobs could increase dry matter digestibility by 31% and organic matter digestibility by 43%.

Table 1. In vitro digestibility

Variable	DMD (%)	OMD (%)
F count	4.020 *	4.179 *
F tab 0.05	2.866	2.866
R0	17.982 ± 2.409	26.024 ± 3.009
R1	21.277 ± 1.561	30.91 ± 2.818
R2	20.483 ± 2.928	28.213 ± 3.066
R3	18.777 ± 1.299	29.527 ± 1.954
R4	24.655 ± 4.858	34.276 ± 5.176
Contrast	F hit	F hit
F table 0.05	4.351	4.351
R0 vs R1,R2,R3,R4	5.223 *	7.7740 *
R1 vs R2,R3,R4	0.000	0.0187
R2 vs R3,R4	0.602	3.9786
R3 vs R4	10.256 **	4.9452 *
Average R1,R2,R3,R4	21.298	30.731
Average R2,R3,R4	21.305	30.672
Average R3,R4	21.716	31.901

Note: * = significant effect (P<0.05);
 ** = highly significant effect (P<0,01)

Table 2. Dry matter and Crude Fiber of amofer corn cob

Treatments	DM(%)	CF (%)
R0	96.33	30.95
R1	94.80	31.79
R2	94.83	29.35
R3	93.65	30.17
R4	93.06	28.97
F count	6.65**	54.31**
F tab 0.05	2.87	2.87

Note: ** = highly significant effect (P<0.01)

The content of microorganism present in M21 Decomposer is able to produce enzymes that degrade compounds in corn cobs. Actinomycetes as one of the microorganisms contained in M21 Decomposer are capable of producing lignocellolytic enzymes that can degrade lignocellulose (Saini et al., 2015). Another microorganism in M21 Decomposer, Pseudomonas, is able to produce protease, amylase and lipase enzymes that can degrade proteins, carbohydrates and other organic matter into CO₂, ammonia gas and other simpler compounds (Hardianto, 2010)

The effect of treatments on the organic matter digestibility

The result of OMD analysis showed that treatment R0 was significantly different

(P<0.05) from that of R1, R2, R3, and R4. High DMD in amofer corn cobs was relevant to that of OMD. Similarly, Prastyawan et al. (2012) stated that organic matter and dry matter digestibility had the same pattern. The higher OMD of amofer corn cobs was because of the increased level of organic matter in the corn cobs. Fitria et al. (2019) reported that corn cobs treated with ammonia fermentation using M21 Decomposer could increase the level of organic matter in the corn cobs.

The OMD of treatment R₄ is significantly higher (P<0,05) from that of R₃. The digestibility of organic matter in the R₄ treatment increased by 8,252% compared to the untreated corn cobs (R₀). It was because of the low crude fiber in amofer corn cob sin R₄. It is evident from the

proximate analysis (Table 2) that the crude fiber of treatment R₄ was the lowest of other treatments. Additionally, high crude fiber could decrease the digestibility of a feedstuff (Yulistiani et al., 2017). Crude fiber is a complex carbohydrate that is difficult to digest so the lower crude fiber in a feed results in higher digestibility and vice versa. The decreased crude fiber in the amofer corn cobs due to microbial fermentation could increase the degradation potential of a compound in feedstuff (Riswara et al., 2018)

Conclusions

The treatments in this study significantly affected the digestibility of both dry matter and organic matter of corn cobs treated with ammonia fermentation consisted of 0.06% M21 Decomposer and 5% urea. This study reported 24.655% dry matter digestibility and 34.276% organic matter digestibility.

Acknowledgement

This research is undertaken with a research grant for junior lecturers from the Directorate of Research and Community Service.

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