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# The Different Innoculant Response Due to the Physical and Nutrision Quality of Corn' Cob Fermentation as Animal Feed

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## ABSTRACT

This study intended to know the physical and nutrition quality on the corn' cob fermentation with the different innoculant. Research method used Completed Random Design with four treatments and four repetitions. The treatments consisted of F0 as the corn' cob without fermentation (the control), F1 as the fermentation of corn' cob with rumen liquid, F2 as the corn' cob with EM-4, F3 as the fermentation of corn' cob with *Trichoderma Viridae*. Research result data of nutrition quality was analyzed by using ANOVA and then it was evaluated with Duncant Test. The physical quality was evaluated with non-parametric statistic like Kruskal Wallis and then it was continued by Multiple Comparison Test. Results showed that fermentation treatment on the corn' cob had significant effect (p = 0.05) on decreasing the crude fiber (CF), increasing the crude protein (CP) and water content, improving the colour and smell texture of corn' cob fermentation. Corn' cob fermentation had ability to improve the value of nutrision and physical quality. The best result of treatment on nutrision quality was increasing the rumen liquif innoculant (F1) with nutrision yield on decreasing the crude fiber (CF) of 36.4%, increasing the crude protein (CP) of 9.35% and water content of 35.18% with good fermentation of physical quality such as soft texture, rather brown of colour, and rather acid of smell as the spesification of fermentation.
**KEYWORDS**: corn' cob, fermentation, innoculant, nutrision quality, physical quality

## INTRODUCTION

Feed is one of the essential factors and very influenced to animal breeding productivity. Feed efficiency with optimized quantity of using or to make efficient the feed price by using waste feed material now is dominant to be carried out by animal breeding nutrision. The effort to minimize feed price can be used the alternative of conventional local feed material and it is not competitif with humand demand and low price but it has nutrision content which is good for animal breeding [1].

The potency of corn'cob as agricultural waste in South Borneo is very much, but it has not been more used as animal breeding feed. Corn'cob is only burned because it is as waste and disturbs the environment. This side result has not been optimally used as animal breeding feed. The basic problem on using of corn'cob as the animal breeding feed is the higher and crude fiber content included the higher content of lignin and silica.The higher content of lignin and silica cause the digestion of corn'cob becomes low and limited consume, so it is needed to be found the technology that can increase the value of nutrision and digestion [2]. One of the technologies that can be used in incresing the quality of corn'cob nutrision as animal breeding feed is the ruminansia by using the method of fermentation. It is hoped to be able to increase the content of crude protein, to decrease crude fiber and to increase the digestion. Fermentation is the reorganizing physically, chemically, and biologically from crude fiber structure, so that the material which is come from complex compound structure becomes to simple compound that has the ability to increase the digestion coefficient of corn'cob. According to Yulistiani [3], the variety of innoculant that is able to used in fermentation can be as rumen liquid, EM4, and trichoderma as the bio-composer.

This research intended to analyze the effect of using the different innoculant to the physical quality (smell, colour, texture, and water content) of corn'cob fermentation and the nutrision quality (crude protein (CP), and crude fiber (CF) and water content of corn cob as fermentation yield.

## MATERIALS AND METHODS

### Research Method

This research used Complete Random Design (RAL) with four treatment and four times repetitions. As the treatment is the different innoculant in corn'cob fermentation. The research treatment included:
F0 = corn'cob without fermentation (as the control)
F1 = corn'cob with the fermentation of rumen liquid
F2 = corn'cob with the fermentation of EM-4.
F3 = corn'cob with the fermentation of Trichoderm

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Fermentation material that was used was corn'cob of 500 g every trial unit which was refined and to be added with rice bran of 5% and molasses of 1% and there was mixed spreadingly and to be added with suitable innoculant with good treatment and suitable dosis of rumen liquid, EM-4, and *trichoderm virideae*. The next step, it was entered to plastic pail and to be well closed with plastic stick so there was anaerob condition. Then it was taken in rather sheltered place and it was stewed during 21 days. After that, it was carried out the harvest of corn'cob fermentation to be analyzed the nutrition and physical quality in laboratory.

**Analysis of data**

Data of nutrision quality was analyzed by using Variant Analysis (ANOVA). If the result showed that there was significant different, then it was continued with median value test by using double regional test of Duncan (DMRT). Data of physical quality was analyzed by using non-parametric test of Kruskal Wallis. If there was significant different, then it was continued with Multiple Comparison of Steel and Torrie [4] Table 1 presented the scoring of physical quality value on fermentation of corn'cob

Table 1 Scoring of physical quality value on fermentation of corn'cob

| No | Smell | Colour | Texture | Score |
|---|---|---|---|---|
| 1. | Spesific acid of fermentation | Brown | Permanent form but soft | 3 |
| 2. | Rather acid | Rather brown | Permanent form but coarse | 2 |
| 3. | Non acid smell | Not change | Lumpy | 1 |

## RESULTS AND DISCUSSION

**Nutrision quality of corn'cob fermentation**

Based on the research about physical and nutrision quality corn'cob fermentation with different innoculant, there was obtained the result as presented in Table 2.

Table 2 Nutrision quality of corn'cob fermentation

| Treatment | Average (%) | | |
|---|---|---|---|
| | Crude fiber | Protein | Water content |
| F0 (control) | 45.21[a] | 6.22[a] | 13.33[a] |
| F1 (rumen liquid) | 36.45[b] | 9.35[b] | 35.18[b] |
| F2 (EM-4) | 38.34[b] | 7.49[b] | 32.43[b] |
| F3 *(Trichoderm Viridae)* | 38.11[b] | 7.71[b] | 30.44[b] |

Note: different supersript on the same column indicated the significant different ($p < 0.05$)

**Crude Protein**

Result of variant analysis indicated that corn'cob fermentation with different innoculant was significantly influenced crude protein (CP) of corn'cob ($p < 0.05$). The highest result of corn'cob due to the raw protein was reached on F1 treatment (rumen liquid) such as 9.35%, it was followed by F3 treatment (*Tri-choderm Viridae*) of 7.71%, F2 treatment (EM-4) of 7.49% and the lowest was F0 (control) without fermentation treatment such as 6.22%. The increasing of crude protein content on F1, F2, and F3 treatment indicated that there was acitivity of sellulotic bacteria on the ideal point. Sellulotic micro-organism secretioned selulose enzym which degradated on weft (selulose and hemi-selulose) on corn'cob, then it produced single cell protein which caused the crude protein increased. Relation curve of innoculant increasing on corn'cob fermentation to the protein content was presented as in Figure 1.

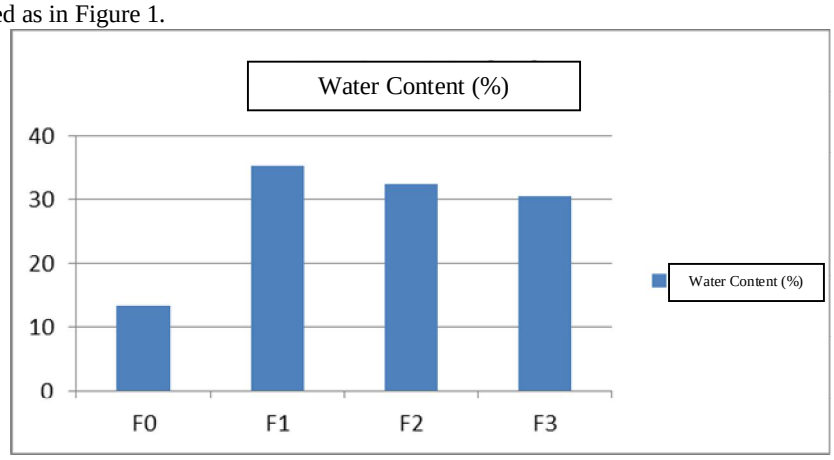


Figure 1 Relation curve of innoculant increasing on corn'cob fermentation to the protein content

The increasing of protein content was caused by the ability and active performance in binding the nitrogen as the basic material for protein synthesis or single cell protein (SCP) which was produced by selulotic microbia on fermentation organic material of corn'cob. Whereas the increasing of molases on fermentation process of rice straw would supply the energy source for sellulotic bacteria on degradating the crude fiber that contented selulosa and hemi selulose [5]

**Crude Fiber**

Result of variant analysis indicated that fermentation of corn'cob with different innoculant was significantly influenced to the content decreasing of corn'cob crude fiber ($p < 0.05$). Result showed that the fermentation of corn'cob was effective in decreasing crude fiber fraction of corn'cob so it was possible as the potential green weft alternative for breeding animal because it was easier digested. The best treatment with the lowest jam content was reached by the F1 treatment (rumen liquid) with the crude fiber (CF) was 16.45%, then it was followed by the F3 treatment (*Trichoderma viridae*) of 38.11%, F2 (EM4) of 38.34% and the worst result was by the highest crude fiber, which was reached by the control without fermentation (F0). Relation curve of innoculant increasing on corn'cob fermentation to the crude fiber was presented as in Figure 2 below.

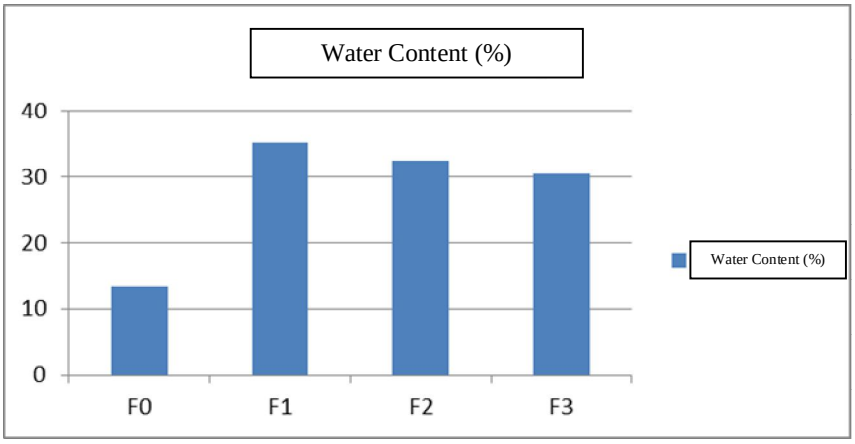


Figure 2 Relation curve of innoculant increasing on corn'cob fermentation to the crude fiber

On the fermentation process, there was happened the reorganizing on chemical composition of organic material by sellulotic micro-organism into volatile fatty acid (VFA) so the crude fiber was decreasing [6]. The decreasing of crude fiber was caused by the fermentation process of active substract which broke sellulose work of sellulase enzym which was produced by sellulotic microbia. Sellulosa, hemi-sellulosa, and pectine which were as crude fiber component could be well digested by sellulotic microbia during fermentation.

**Water content**

Result of variant analysis indicated that corn'cob fermentation significantly influenced to the water content of corn'cob fermentation ($p < 0.05$). The treatment of F1 innoculant (rumen liquid) produced the highest water content and has reached 45.18%, and then followed by F2 by using EM-4 as innoculant such as 32.43% and F3 by using . *Trichoderma viridae* innovulant such as 30.44%, and the lowest was F0 (control) such as 30.44%. The relation curve of innoculant increasing of corn'cob fermentation to the raw protein content was presented as in Figure 3 below.

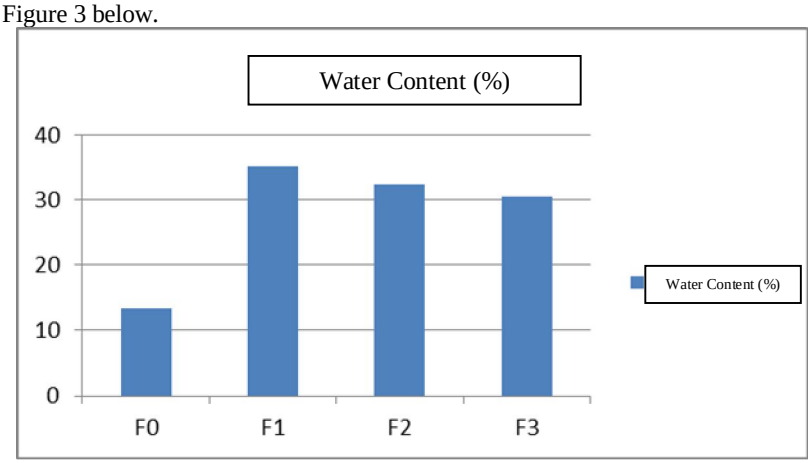


Figure 3 Relation curve of innoculant increasing of corn'cob fermentation to the water content

Trend of water content increasing on the treatments of F1, F2, and F3 were caused by that during the fermentation process, water content increasing was caused by respiration level that changed glucosa into $H_2O$ [7]. During the fermentation process, there was happened water content decreasing of dry material (BK) and organic material (BO). All of them on the fermentation level was as follow:

1. Level-1: aerob fermentation (still in respiration) which the glucosa was changed into $CO_2$, $H_2O$, and caloric. So part of glucosa fraction that was as dry material fraction (BK) would be loss which the biggest losses of BK was caused by oxidation during the fermentation process.
2. Level-2: anaerob fermentation which glucosa was change into lactate acid, ethanol, and $CO_2$. The losses of BK and BO would be bigger if the fermentation activity was dominated by hetero-fermentative bacteria.

**The physical quality of corn'cob fermentation**

Research result of physical quality test (smell, colour, texture) of corn'cob that was fermentasioned was presented as in Table 3 below.

Table 3 Scoring result on physical quality of corn'cob fermentation

| Treatment | Avereaged scoring (%) | | |
|---|---|---|---|
| | texture | colour | Smell |
| **F0 (control)** | $1.89^a$ | $1.10^a$ | $1.10^a$ |
| **F1 (rumen liquid)** | $2.67^c$ | $2.88^c$ | $2.67^c$ |
| **F2 (EM-4)** | $2.51^b$ | $2.42^b$ | $2.42^b$ |
| **F3 *(Trichoderma Viridae)*** | $2.51^b$ | $2.44^b$ | $2.45^b$ |

Note: different superscript on the same column indicated the significant different ($p < 0.05$).

**Texture**

Result of Kruskal Wallis analysis indicated that fermentation of corn'cob fermentation with different innoculant significantly influenced to the texture of corn'cob fermentation ($p < 0.05$). The score indicated that all of the innoculant treatment produced the texture that was better than control without fermentation (f0). The best texture was reached by F1 treatment (rumen liquid) that produced the texture score of 2.67. then followed by F2 treatment (EM-4) and F3 (*Trichoderma virideae*) with the score of 2.51 and the lowest was as the control such as 1.89

Fermentation process caused the condition of fermentation environment became hot that could give the effect on the structure of corn'cob [8] Fermentation reorganized the coarse structure physically, chemically, and biologically so the organic material of coarse structure became into softer structure. It caused digestion power of corn'cob became more efficient. Organic material with the increasing of an enzym or certain micro organism caused the physical change, oerformance, and taste due to the biological process in material. Kurnianingtyas *et. al* [9] said that the silase that was given acelerator (rice bran and molasses) had soft texture and not mucous.

**Colour**

Result of Kruskal analysis indicated that fermentation of corn'cob with different innoculant significantly influenced the colour of corn'cob fermentation ($p < 0.05$). The colour change was caused by the effect of increasing N from the innoculant that was added to corn'cob so there was happened reorganizing of corn cob structure. In addition, factor of heat energy influenced the damage of colour pigment [10]. Whereas according to Kurnianingtyas *et.al* [9], the colour change on crop that experienced the fermentation process was caused by the change in the crop because aerobic respiration process which happened during there was still oxigen supply until the crop sugar was left. Sugar would be oxidized into $CO_2$ and water, and there was caloric so the temperature would be up. The continued increasing of temperature without bei=ng controlled would caise dark brown silase until black.

**Smell**

Result of Kruskal Wallis analysis indicated that corn'cob fermentation with different innoculant significantly influenced to the smell of corn'cob fermentation ($p < 0.05$). Different test result of Multiple Comparison on the significant level of 0.05 indicated that between F0 (control) with all of the treatment (F1, F2, F3) indicated the significant different, while the F1 treatment (rumen liquid) significant different with F2 treatment (EM-4) and F3 (*Trichoderma virideae*). Result of acid smell on special corn'cob fermentation was looked on the three treatments which were given the best innoculant by rumen liquid, EM-4, and *Trichoderma Viridae.*

Condition of micro-bi0logy from fermentated material which there was fermentative microba inside could change the carbohydrate and its differentiation into alcohol, acid, and $CO_2$ [10]. Then, proteolitic microba could prevent the protein and the other component of nitrogen so it produced the unhoped bad smell. However, lipolitic microba would hydrolisis fat, fostolipid, and its differentiation by producing bad smell. Silase with good physical characteristic had acid and good smell of fermentation, untinder and not clotting. [9].

## CONCLUSION

Based on the analysis as above, it was concluded as follow:

1. Corn.cob fermentation significantly influenced in increasing the parameter of nutrision quality (crude protein, crude fiber, water content) and it was able to improve the physical quality (texture, colour, smell) of corn'cob fermentation
2. The best treatment of nutrision quality was produced by fermentation treatment with rumen liquid innoculant (F1) with the reached crude protein content (CP) of 9.25%, crude fiber (CF) of 36.45%, and water content of 35.18%
3. The best treatment of physical quality was produced by the fermentation treatment with innoculant increasing of rumen liquid (F1) with the reached average of texture scoring of 2,67% (permanent shape but rather soft), colour of 2.88% (towards brown), and smell of 2.67% (acid smell spesific fermentation)

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