

IN VITRO DIGESTIBILITY ANALYSIS OF SHEEP BASED ON CORN COBS FERMENTED WITH WINPROB AT DIFFERENT TIMES

By

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Abstract: The aim of this research was to determine the efficiency of corn cobs fermented with Winprob for different periods of time on dry matter digestibility, organic matter digestibility and crude fiber digestibility in vitro. The hypothesis of this research is that giving Winprob probiotics to fermented corn cobs for different periods of time can increase dry matter digestibility, organic matter digestibility and crude fiber digestibility. The research design used was a non-factorial completely randomized design (CRD) with 4 treatments and 5 replications. The treatments studied were as follows: P0 (control/unfermented corn cobs); P1 (Corn cobs fermented with Winprob for 7 days); P2 (Corn cobs fermented with Winprob for 14 days) and P3 (Corn cobs fermented with Winprob for 21 days). The parameters observed were Dry Matter Digestibility, Organic Matter Digestibility and Crude Fiber Digestibility of sheep in vitro. The results of research on the KcBk and KcSK parameters showed that the treatment had a very significant effect ($P < 0.01$). Meanwhile, the KcBO parameter showed that the treatment had no real effect ($P > 0.05$).

INTRODUCTION

Feed is a very important aspect and has a big influence on increasing livestock production. Apart from playing a role in increasing livestock productivity, feed also influences the economic aspects of the livestock business because around 60% -80% of production costs are spent on providing feed. One way to provide ruminant feed is by utilizing leftover agricultural, plantation and agro-industry products. Yields agricultural production Enough tall is corn. Besides that corn is source energy main material feed especially For animal cattle. From BPS data for North Sumatra Province for 2022 it is known that wide harvest plant corn around 289,238 ha, with results production 1,806,544 tons.

Yields from waste plant corn that can utilized as feed cattle is cob corn. Corn cobs have great potential to be used as an alternative feed ruminant livestock Because No compete with need human and have content adequate nutrition For livestock (Sandy et al., 2023). Therefore Therefore, to improve the quality of corn cobs as ruminant feed, a physical, chemical and biological processing process can be carried out. Fermentation is a biological method that can be applied to improve the nutritional quality of corn cobs as ruminant feed,

and it is hoped that this method can increase the digestibility of low quality feed. Fermentation functions to break down complex organic materials into simpler ones so that they are easier to digest by utilizing microorganisms (Prasetyo et al., 2022).

In the biological processing process, complex ingredients generally change into simpler ones so that they are easily digested and absorbed by livestock. Winprob is a bioactivator that contains microorganisms such as *aspergillus niger*, *bacillus subtilis*, *latobacillus acidophyllus*, *rhizopus oligosporus*, *saccharomyces cerevisiae* and *trichoderma viriae*. Use appropriate bioactivator in the fermentation process can increase quality nutrition and digestibility cattle to feed, for measure n digestibility value in a way No direct outside body cattle can done with *in vitro* techniques. The *in vitro* technique is a technique for measuring the digestibility value of a feed ingredient in a fermenter tube by imitating the conditions of ruminant digestive organs which can be done easily, quickly and economically (Ramaiyulis et al., 2022). Onggok fermented with Win Prob probiotics in liquid form with a storage period of 4 weeks is able to increase crude protein, gross energy and reduce crude fiber (Pratama & Siregar, 2024). Based on from background behind the researcher interested For do research entitled Digestibility Analysis cattle sheep in a way *in vitro* based cob fermented corn with winprob with different times with hope able to improve the quality of digestibility material dryness, digestibility material organic and digestibility fiber rough.

RESEARCH METHODS

Study This held from January to month February at the Panca Budi Development University Laboratory and continued with *in vitro* tests at the Laboratory Farm Faculty Jambi University Farm.

The materials used in the research were corn cobs, winprob, molasses, urea and sheep rumen fluid. McDougall's fluid with a composition of 9.8 gr NaHCO₃; 4.62 gr Na₂HPO₄.12H₂O; 0.57 gr KCl; 0.12 gr MgSO₄.7H₂O; 0.47 gr NaCl; 0.05 gr CaCl₂.2H₂O in 1 L solution, HgCl₂, Na₂CO₃, 200 ml sheep rumen fluid, 0.2% pepsin dissolved in 0.1 N HCl and distilled water.

The tools used in the research were plastic drums, buckets, water buckets, scales, shovels, writing utensils as well laboratory needs such as grinders, ovens, furnaces, analytical balances, *centrifuge tubes*, flasks, *centrifuges*, *water bath shakers*, hoses, CO₂ gas cylinders, ventilated lids, desiccators, funnels, *Whatman paper* and pH meter and equipment analysis *in vitro*.

This research method uses an experimental design used in the research is a non-factorial Completely Randomized Design (CRD) with 4 treatments and 5 replications. The treatment provided is as follows:

- P 0 : Cob corn without fermentation
- P 1: Cob fermented corn with Winprob for 7 days
- P 2: Cob fermented corn with Winprob for 14 days
- P 3: Cob fermented corn with Winprob for 21 days

Research Preparation

Refining corn cobs is carried out using the following process:

- The corn cobs obtained must first be cleaned of foreign objects.
- The corn cobs are then dried in the sun until dry for a more optimal grinding process.
- The dried corn cobs are then ground using a corn cob crusher machine.
- After grinding the corn cobs are dried in the sun again until the water content is reduced.
- Corn cobs are ready to be used as feed

Procedure for Making Fermented Corn Cobs

The first stage is to prepare all the ingredients for fermented corn cobs, then weigh them based on the requirements for making them. Pour the corn cobs on the cement floor, while the probiotic (winprob) is dissolved in water that has been mixed with molasses (the amount of water used is ± 30 percent of the total ingredients or 60% humidity) then the water mixed with the molasses and winprob is poured over the top. corn cobs and sprinkle urea on top, then stir using a shovel until homogeneous (even). After that, put the corn cobs into a plastic drum, compact them by stepping on them, then close the drum tightly and ferment for 7 days, 14 days, and 21 days. anaerobically.

Analysis Sampling

Samples for chemical analysis of nutritional content were taken randomly from corn cobs made based on treatment. Sampling starts from the beginning of feed production before fermentation (P0), 7 days after fermentation (P1), 14 days after fermentation (P2), and 21 days after fermentation (P3). The samples that have been taken are immediately dried (drying in the sun/oven at 60 degrees Celsius), then the samples are weighed and ground with a blender for later analysis in the laboratory.

Taking Rumen Fluid

The thermos used for rumen fluid is a thermos made from material plastic, glass and cork. This thermos is filled with warm water so that the temperature reached $\pm 39^\circ\text{C}$ later closed. Rumen fluid is taken from sheep House cut animal (RPH), before used for rumen fluid, hot water available in the thermos is thrown away. Then the rumen is squeezed to take the liquid with a cloth nylon filter gauze 40 micron poly mesh 400 and inserted into the thermos warm.

In Vitro Test

Digestibility test *in vitro* Two stages are carried out, namely:

Stage First:

Tube polypropylene 50 mL. (Ticare Tube 50 mL centrifuge) was used as tube fermenter. Tube previously filled fermentation cob corn as much as 2 g. Samples of feed used has grinded through filter with size 1 mm. Every tube that has been prepared in accordance treatment, 30 mL of the mixture was added Dougall's MC solution and rumen fluid with 4:1 ratio. Tube without sample fermentation cob corn prepared (tube called blank), then treated the same with others. Residue from blank furthermore in calculation digestibility fermentation cob corn, be reduction (correction) of the residue digestibility feed. Solution mixture of MC Dougall and rumen fluid continues continuously supplied with CO₂ gas for 30 minutes with temperature 39°C inside water bath for ensure condition anaerobes until the pH reaches 6.9. Furthermore mixture the entered in tube fermenter, then quick closed with

plug rubber valve (valve works as resulting gas release fermentation). Tube Then incubated at 39 °C for 48 hours in a shaker bath/ incubator (water heater). Stage First is imitation (artificial) digestive process fermentative in the rumen . End of stage First closed tube opened and continued on stage following .

Stage second :

After carried out 48 hour fermentation , fermentation microbes stopped . Tube fermenter placed over cold water or ice for stop activity microbes , then taken the substrate added pepsin- acid solution chloride (HCl). Every tube added respectively 2 ml HCl 4 N and 0.06 g pepsin. Then incubated returned to a temperature of 39°C for 48 hours incubator without closed rubber . Leftovers from digestion filtered use paper strain and put in glass crucible Then entered into a 105 °C oven for 24 hours. Residue digestibility previously weighed and entered to the oven 105 °C for get residue material dry (BK) End of stage second , content tube filtered with sintered glass, the residue analyzed more carry on For get variable digestibility . Stage second is imitation (artificial) digestive process hydrolysis enzymatic in the post rumen.

Analysis Data

Results data study analyzed with fingerprint variance ANOVA and if there is real difference will next with the DUNCAN advanced test .

Observed Parameters

Coefficient Digestion of Dry Material

Dry matter digestibility coefficient is an indicator for determining ration quality. The higher the dry matter digested, the higher the opportunity for nutrients that can be utilized by livestock for growth. The *in vitro* digestibility of dry matter was calculated using the following formula (Tilley and Terry, 1963):

$$\%KcBK = \frac{\text{Berat BK sampel (g)} - \text{Berat BK residu(g)} - \text{Berat blanko(g)}}{\text{BK sampel(g)}} \times 100\%$$

Digestibility coefficient of organic materials

The digestibility coefficient of organic matter is the percentage of protein, fat, vitamins and carbohydrates that are digested during the digestive process. The high and low KCBO of feed can describe the availability of energy that can be utilized for livestock. The *in vitro* digestibility of organic materials is calculated using the following formula (Tilley and Terry, 1963):

$$\%KcBO = \frac{\text{Berat BO sampel (g)} - \text{Berat BO residu(g)} - \text{Berat blanko(g)}}{\text{BO sampel(g)}} \times 100\%$$

Coefficient Digestibility of Crude Fiber

As much 2 grams sample entered into the Cup porcelain , then oven at 105°C for 12 hours, and cooled in desiccator ±1 hour. After cold do weighing furthermore light it up into the furnace at 600°C for 8 hours until become ash , then entered to desiccator for 1 hour, then weigh it and do it calculation with formula as following :

$$\%KcSK = \frac{\text{Berat SK sampel (g)} - \text{Berat SK residu(g)} - \text{Berat blanko(g)}}{\text{SK sampel(g)}} \times 100\%$$

RESULTS AND DISCUSSION

The overall research results including *in vitro* KcBK, KcBO and KcSK values are presented in Table 1

Table 1. Average recapitulation of research results for KcBK, KcBO, KcSK In vitro corn cobs fermented with Winprob at different times.

Treatment	Observation Parameters		
	KcBK	KcBO	KcSK
P0	35.74 ^A	50.46 ^{tn}	29.68 ^A
P1	40.71 ^B	55.23 ^{tn}	31.99 ^{AB}
P2	42.07 ^C	60.31 ^{tn}	33.88 ^B
P3	44.30 ^D	66.69 ^{tn}	33.73 ^B

Note: different superscripts on the same line indicate very significant differences (P<0.01).

Dry Matter Digestibility Coefficient (KcBK)

Table 1 shows that the highest average dry matter digestibility in the treatment of corn cobs fermented with Winprob for 21 days (P3) was 44.30%, then in the treatment of corn cobs fermented for 14 days (P2) it was 42.07%, in the treatment Corn cobs fermented for 7 days (P1) was 40.71% and the lowest in the control treatment was corn cobs without fermentation (P0) at 35.74%. This is thought to be because an increase in the length of fermentation time has a good effect on the feed ingredients, resulting in P3 treatment (corn cobs fermented with Winprob for 21 days) provided higher dry matter digestibility compared to other treatments. This is in accordance with the opinion of Nasih et al (2014) that increasing the digestibility of a feed ingredient is due to increasing the number of microbes in the rumen.

The results of the variance analysis showed that giving Winprob to fermented corn cobs in each treatment had a very significant effect (P>0.01) on dry matter digestibility, meaning that giving Winprob to fermented corn cobs on dry matter digestibility gave an increase in dry matter digestibility. in each treatment. This is because probiotic supplements, which are a source of microbes, especially *Aspergillus niger*, which is a cellulolytic bacteria that produces cellulase enzymes, can cause the population and activity of microbes in the rumen to increase so that feed digestibility will also increase. The increase in the population of rumen bacteria is closely related to the fermentation process of various feed nutrients, both cellulose, hemicellulose and other dissolved materials (Bata & Rustomo, 2009).

Organic Material Digestibility Coefficient (KcBO)

Table 1 shows that the highest average digestibility of organic matter in the treatment of corn cobs fermented with winprob for 21 days (P3) was 66.69%, then in the treatment of corn cobs fermented for 14 days (P2) it was 60.31%, in the treatment Corn cobs fermented for 7 days (P1) was 55.23% and the lowest in the control treatment was corn cobs without fermentation (P0) at 50.46%. From table 1 it can be said that fermentation treatment of corn cobs with Winprob with different fermentation times can increase the digestibility of organic matter higher than corn cobs without fermentation.

Based on the results of the analysis of variance, it showed that giving Winprob to each

treatment had no significant effect ($P>0.05$) on the digestibility of organic matter. Increased digestibility in P3 treatment (corn cobs fermented with Winprob for 21 days) is caused by an increase in the bacterial population in the rumen. The high KCB0 value in the P3 treatment is thought to be because during fermentation the bacteria obtain sufficient energy sources, so they work optimally in degrading fiber and rumen microbes. (Puastuti, 2009) stated that giving probiotics will increase the population of rumen bacteria so that digestibility will increase.

The ash content slows or inhibits the digestion of the dry matter of the ration. The increase in organic matter digestibility is due to the increase in dry matter digestibility. An increase in crude protein content will cause increased rumen microbial activity and digestion of organic material. This is in accordance with the statement of (Lehan, 2015) that the digestibility of organic matter reflects the amount of substances digested, especially nitrogen compounds, carbohydrates, fats and vitamins.

Crude Fiber Digestibility Coefficient (KcSK)

Table 1 shows that the highest average crude fiber digestibility in the treatment of corn cobs fermented with winprob for 14 days (P2) was 33.88%, then in the treatment of corn cobs fermented for 21 days (P3) it was 33.73%, in the treatment Corn cobs fermented for 7 days (P1) was 31.99% and the lowest in the control treatment was corn cobs without fermentation (P0) at 29.68%. The research results showed that fermenting corn cobs with Winprob for different lengths of time had a significant influence on crude fiber digestibility and provided crude fiber digestibility that was much higher than the digestibility of corn cob crude fiber without fermentation. (Purba & Prasetyo, 2014) stated that the crude fiber content in the feed used greatly influences crude fiber consumption. If the crude fiber composition is too high, it can reduce consumption levels and if the crude fiber composition is too low it will have a negative impact on fermentation activity in the rumen.

Table 1 shows that the average digestibility value of crude fiber increased in the P0, P1, P2 treatments, but there was a decrease in the digestibility value in the P3 treatment. The highest digestibility value was found in the treatment of corn cobs fermented with Winprob in treatment P2 (corn cobs fermented with Winprob for 14 days) of 33.88%. Duncan's further test results showed that the digestibility of crude fiber in treatment P2 was very significantly different from treatment P3 (corn cobs fermented with Winprob for 21 days).

Rumen fluid contains various kinds of microbes that produce various types of enzymes such as amylase, protease and cellulase. These enzymes will degrade these food substances into simpler forms, this makes it easier for rumen bacteria to digest the feed so that feed digestibility increases (Hanafi & Tafsir, 2015; Jhonson, 1996). According to (Chen et al., 2004) stated that corn cobs are classified as low quality fiber feed, their digestibility and palatability are low. The low digestibility is due to the high lignin content which forms a complex with cellulose and hemicellulose. Therefore, so that the nutritional value and digestibility can be increased, processing needs to be carried out. One alternative to improve the quality of feed ingredients is fermentation techniques.

CONCLUSIONS

From the results of the research and discussion it can be concluded that:

1. Fermentation of corn cobs with the addition of the probiotic Winprob for 21 days

- (P3) was the best treatment for KcBK *in vitro* at 44.30% and KcBO *in vitro* at 66.69% which was very significantly different compared to treatments P0, P1 and P2
2. Fermentation of corn cobs with the addition of the probiotic Winprob for 21 days (P3) was the treatment that had the highest digestibility value for the KcBK of sheep *in vitro* at 33.88%.

RECOMMENDATIONS

It is recommended to carry out *in vivo* digestibility in sheep based on fermented corn cobs with Winprob.

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HALAMAN INI SENGAJA DIKOSONGKAN