International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 08 Issue 07 July 2025
DOI: 10.47191/ijcsrr/V8-i7-16, Impact Factor: 8.048
IJCSRR @ 2025
www.ijcsrr.org

Effect of Condensed Molasses Soluble (CMS) as a Feed Ingredient on the Characteristics, pH and Intestinal Viscosity, and Intestinal Microba in Hybrid Ducks

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ABSTRACT: This study was conducted to evaluate the effect of using Condensed Molasses Soluble (CMS) on the gut microba, pH and viscosity of hybrid ducks. One hundred and sixty hybrid ducklings (Day Old Duck) initial body weight 55 grams were randomly divided into 5 treatments with 4 replicates (8 each) in a Completely Randomized Design. The treatments were basal feed without CMS as control treatment (T0), basal feed supplemented with 2.5% CMS (T1), basal feed supplemented with 5% CMS (T2), basal feed supplemented with 7.5% CMS (T3), basal feed supplemented with 10% CMS (T4). Parameters measured were analysis of *Lactobacillus* sp, and *Escherichia coli*, pH and viscosity of hybrid ducks. There was a very significant difference (P<0.01) on the microba, with the highes results *Lactobacillus* sp (200±95,68) *Escherichia coli* (289±22,00) and pH (6,5±0,58) and viscosity (3,6±0,11) of hybrid duck intestinal digesta. Based on these findings, it is concluded that the use of CMS with a maximum percentage of 7.5% had a positive effect on the health of the intestinal digesta of hybrid ducks due to reduction of the population of pathogenic microba (*Escherichia coli*).

KEYWORDS: Condensed Molasses Soluble (CMS), Hybrid ducks, Intestine, Microba.

INTRODUCTION

Hybrid duck farming in Indonesia is currently a potential business. Hybrid ducks are a cross between two types of ducks, so their traits inherit the traits of their two parent parents. The population of ducks in East Java according to the Central Bureau of Statistics in 2021 was about 8.0 million ducks and increased in 2022 to 8,3 million ducks. Factors that can determine the success of hybrid duck breeding are the quality of breed and feed. Expensive feed costs are caused by imported proteinous feed ingredients, so the higher the feed protein needed, the higher the price of feed that must be issued. The process of raising hybrid ducks consists of the starter phase (1-13 days), grower (14-30 days), and finisher (31-50 days). The difference between the three phases lies in the amount of protein in the feed. In the starter phase, ducks requires 22% protein, in the grower phase 16% protein is needed, and in the finisher phase 15% protein is given.

Utilization of local raw materials is an alternative to reducing feed costs, but this is not enough to overcome the problem because a large amount of protein is needed. Therefore, the utilization of industrial waste by-products has potential as an additional feed ingredient including protein sources and energy sources that do not compete with human needs, one of which is Single Cell Protein (SCP). SCP is one component of animal feed ingredients with a high protein content of approximately 60% and contains complete amino acids, so it has the potential to be used as poultry feed. The utilization of SCP derived from industrial waste as a protein substitute feed ingredient has begun to be developed in Indonesia This can reduce the level of imports and dependence on its use. Previous studies have shown that the use of SCP with a percentage of 4.5% in poultry, single cell protein can increase body weight gain, Income Over Feed Cost (IOFC), live weight, carcass weight, carcass percentage, breast meat percentage and reduce feed conversion. Based on information from previous researchers, although CMS has many benefits, there are several challenges in its use, including the source and dose of CMS which can cause negative effects on growth and health, so the dose used in the study was estimated and not more than 10%.

Based on this, this study aimed to evaluate the effect of using CMS as a feed ingredient on the characteristics and gut microba of hybrid ducks. CMS as a feed ingredient for hybrid ducks is expected to be a promising solution as an alternative feed ingredient

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for hybrid ducks and can replace a large portion of conventional protein without compromising performance or meat quality, thus offering additional benefits for health and sustainability.

MATERIALS AND METHOD

The products of CMS used in this study are by-products of fermentation processes. CMS came from the product of PT Daesang Ingredients Indonesia.

A. Preparation of Condensed Molasses Soluble (CMS)

The products of CMS used in this study came from the product of PT Daesang Ingredients Indonesia which was produced by utilizing MSG waste that had undergone fermentation. The sources of microbial protein that can be utilized as CMS are Brevibacterium sp. In these processes, most of the sucrose content of the molasses is consumed by microbiological action. The resulting liquid waste has very little residual sugar content. It is this waste which is condensed, further processed as CMS.

B. Experimental Design

This study was conducted using a Completely Randomised Design (CRD). The feed treatments given were basal feed without CMS as the control treatment (T0), basal feed supplemented with 2.5% CMS (T1), basal feed supplemented with 5% CMS (T2), basal feed supplemented with 7.5% CMS (T3), basal feed supplemented with 10% CMS (T4). The mixing of basal feed with CMS for the respected treatments was mixed according to the percentage of each treatment, and given 2 times a day for 35 days of raising hybrid ducks.

C. Experimental Animals and Cages

This study was conducted for 35 day s using 160 DOD hybrid ducks with an initial body weight of 55 grams. Ducks were kept in colony cages measuring 2 meters long, 1 meter wide, and 1 meter high. Each unit was filled with 8 hybrid ducks, equipped with feed and drinking water containers. The basal feed used was complete starter and finisher feed from New Hope Company and CMS as feed ingredient obtained from Daesang Ingredients Indonesia Company. Hybrid ducks were randomly divided into 5 treatments with 4 replications (8 birds each).

D. Statistical Analysis

The data results in the study were analyzed using Analysis of Variance of a Completely Randomised Design (CRD) using Microsoft Excel, if the results showed significant ($P<0.05$) effect, it would be followed by Duncan's Multiple Range Test.

E. Ethical Considerations

The study is based on institutional ethical guidelines for animal research No. 11-KEP-FKHUB-2025 ensuring that experimental procedures meet the rules, minimizing stress and inconvenience. Livestock surgery was carried out under the supervision of a veterinarian, and the experiment was in accordance with the compliance of the Faculty of Animal Husbandry, Universitas Brawijaya based on the rules of animal welfare standards.

RESULT AND DISCUSSION

The effect of using CMS as a feed ingredient on the pH and viscosity of the intestinal digesta of hybrid ducks is shown in Table 1. as follows.

Table 1. Treatment of Using CMS as a Feed Ingredienr on The pH and Viscosity of The Intestinal Digesta of Hybrid Ducks

Treatment	pH	Viscosity (m^2/s)
T0	6,0±0,82	3,6±0,11
T1	5,5±0,58	3,5±0,17
T2	6,0±0,82	3,5±0,08
T3	6,5±0,58	3,4±0,03
T4	6,5±0,58	3,5±0,04

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Effect on pH

The effect of the treatment of using CMS as a feed ingredient had no significant effect (P>0.05) on intestinal pH. The study is in accordance with Hombegowda, et al., (2021) in a study which stated. that the feeding of feed containing SCP with different treatments ranging from 2.5%, 5%, 7.5%, and 10% did not have a significant effect on the intestinal pH of broiler chickens. The digestive tract affects the life of digestive microbes, which are closely related to digestive enzymes and enzymes from microorganisms found in feed. Stomach acid (HCl) is naturally secreted by digestive juices, creating an acidic environment, and the acidic conditions of the stomach serve to select which microbes will enter the intestines.

Effect on Viscosity

The results concluded that CMS did not have a significant effect (P>0.05) on the viscosity of the small intestine of hybrid ducks. CMS does not affect the viscosity value of the intestinal digesta, this is due to the low viscosity of CMS and is not significantly different from the control treatment with other treatments. High viscosity can burden the intestine to absorb feed nutrients. An increase in the viscosity value of the small intestine can reduce digestive efficiency, this is in accordance with Tejeda and Kim, (2021) which states that an increase in digesta viscosity can worsen intestinal health, and decrease the use of energy and nutrients in feed, so the use of CMS has a positive effect on the intestinal health of hybrid ducks. The effect of using CMS as a feed ingredient on the gut microba of hybrid ducks is shown in Table 2 as follows.

Table 2. Treatment of CMS As a Feed Ingredient on The Gut Microba of Hybrid Ducks

Treatment	*Lactobacillus* sp (CFU/ml)	*Escherichia coli* (CFU/ml)
T0	200 ± 95.69^{B}	289 ± 22.00^{B}
T1	$55\pm10,.15^{A}$	$46,5\pm21.06^{A}$
T2	81 ± 42.91^{A}	$122,5\pm51.75^{A}$
T3	56 ± 6.18^{A}	30.75 ± 0.96^{A}
T4	53 ± 13.60^{A}	26.25 ± 2.99^{A}

$^{A-B}$ Means in each column with superscripts that are significantly different at P<0.01

Effect on *Lactobacillus* sp

The treatment of using CMS as a feed ingredient for hybrid ducks had no significant effect (P<0.01) on the Total Plate Count (TPC) of lactic acid bacteria of hybrid ducks. The conclusion of this study showed that the largest population of lactic acid bacteria was obtained by the control treatment (T0: 200±95.69), but overall there was no significant effect on other treatments. The use of singlecell protein in broiler feed reduces the population of Salmonella and E. coli bacteria and provides conditions for the growth of beneficial bacteria such as *Lactobacillus*, according to the results obtained, an increase in the population of *Lactobacillus* bacteria was observed in broilers fed with single-cell protein. The increase in feed intake of broilers and weight gain receiving the treatment could be due to a reduction in the number of harmful bacteria and an increase in the number of beneficial bacteria due to the use of single-cell protein. The researchers stated that the use of single-cell protein substrate in broiler feed can develop the gastrointestinal tract and maintain the integrity of the intestinal mucous membrane of broiler chickens.

Effect on *Escherichia coli*

The use of CMS as a feed ingredient had a very significant effect (P<0.01) on the TPC of *Escherichia coli* bacteria. The best treatment was obtained by T4 (26.25±2.99), this happened because in the study no *Escherichia coli* population was found. Amjadian, et al., (2015) in a study conducted stated that the use of CMS in broiler feed at different levels of 0%, 4%, and 8% had no significant impact on the calculation of microbial populations (*Escherichia coli*). The study did not observe a decrease in growth performance in all treatments, this is in accordance with the research conducted that in a percentage of 7.5% and even 10% the use of CMS is able to inhibit the growth of pathogenic bacteria (*Escherichia coli*).

Khan, et al., (2021) in a study conducted on the utilization of single cell protein production as a source of protein in broiler rations stated that no adverse side effects were found from the replacement of single cell protein in broiler chickens. The single cell protein used has a positive impact on poultry health because it can regulate gut microba and strengthen the host's natural defenses. The

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study also stated that single cell protein as a substitute for protein sources derived from soybean feed ingredients can control the growth of pathogenic bacteria in livestock and on the other hand, can be a nutrient for other normal microba.

CONCLUSION

The use of Condensed Molasses Soluble (CMS) as a feed ingredient for hybrid ducks with a percentage of 7.5% has a positive effect on increasing pH stability and pupulation of non-pathogenic bacteria (*Lactobacillus* sp) and reducing the level of viscosity and colonies of pathogenic bacteria (*Escherichia coli*), while the use of 10% CMS can reduce the intestinal health of hybrid ducks.

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Cite this Article: Pasaribu, D.G.S., Widodo, E., Tistiana, H., Sjofjan, O. (2025). Effect of Condensed Molasses Soluble (CMS) as a Feed Ingredient on the Characteristics, pH and Intestinal Viscosity, and Intestinal Microba in Hybrid Ducks. International Journal of Current Science Research and Review, 8(7), pp. 3278-3281. DOI: https://doi.org/10.47191/ijcsrr/V8-i7-16