

The Addition of Lauric Acid from DPKFA (Distilled Palm Kernel Fatty Acid) as A Feed Additive on The Physiological Responses of Broiler

Muhammad Nur Ikhlas¹, Adelina Ari Hamiyanti², Osfar Sjofjan³

¹Postgraduate Master Student, Faculty of Animal Science, Brawijaya University, Malang

²Lecturer of Animal Production, Faculty of Animal Science, Brawijaya University, Malang

³Lecturer of Nutrition and Animal Feed, Faculty of Animal Science, Brawijaya University, Malang

ABSTRACT: The aim of the research is to examine the effect of adding additive products to feed on the physiological responses of broilers during 1 (one) rearing period including rectal temperature, shank temperature, comb temperature, respiratory frequency and heart rate frequency. The research was conducted from September 21 to October 26, 2024 in Mr. Soleh's Farm, Kidal Village, Tumpang District, Malang Regency, East Java. The material used in this study was non-sexing DOC (Day Old Chick) strain Lohmann from PT Japfa Comfeed Tbk. A total of 300 broilers with a body weight diversity coefficient of less than 10% were reared for 35 days. This study used 6 treatment groups, each consisting of 5 replicates including T0 (Basal feed as control treatment), T1 (Basal feed + zinc bacitracin 0.1% as positive control treatment), T2 (Basal feed + 0.05% feed additive product), T3 (Basal feed + 0.10% feed additive product), T4 (Basal feed + 0.15% feed additive product) and T5 (Basal feed + 0.20% feed additive product). The data obtained were analyzed using analysis of variance (ANOVA) and continued with Duncan's Multiple Range Test (DMRT) if there was a significant effect. The results showed that the addition of DPKFA-based feed additive products with high lauric acid content in the feed did not significantly affect the physiological response of broilers ($P>0.05$). The provision of additives with the highest concentration helps to optimize the physiological response of broilers so that this product can be recommended as a substitute for the role of AGP to support the performance of broiler production and health.

KEYWORDS: feed additive, broiler, lauric acid, physiological responses

INTRODUCTION

The annual increase in Indonesia's population affects the demand for consumption of livestock products as an effort to fulfill animal protein nutrition. Based on data from the National Food Agency (Bapanas), in 2023 the average Indonesian consumes 7.46 kg of broiler meat per capita per year. The high consumption of broiler chicken leads to an increase in demand for broiler chicken. This is in line with the increasing awareness of consumers who are selective about the quality of broiler productivity. This increase in demand requires livestock businesses to emphasize the efficient use of feed and broiler production costs.

On the other hand, a major challenge in the broiler industry is the use of antibiotics as growth promoters (AGPs), which are banned by the government through Minister of Agriculture Regulation No. 14/2017. The AGP ban policy aims to prevent antibiotic resistance (AMR), which can have negative impacts on human and animal health[1]. The use of AGPs in livestock may increase growth in the short term, but risks damaging the balance of gut microbiota that is important for digestion and overall health. In addition, antibiotic residues that are not fully metabolized can contaminate the environment through livestock excretion, affecting water and soil quality. With the ban on AGP use, farmers need to find safer and more sustainable alternatives to improve broiler productivity.

One promising alternative is the use of feed additives based on natural ingredients or phytobiotics, such as Distilled Palm Kernel Fatty Acid (DPKFA), which contains lauric acid (C12) and has great potential to support animal health without negative side effects [2]. Lauric acid has antibacterial, antiviral, and antioxidant properties that can improve feed efficiency, chicken growth, and overall poultry health. The use of lauric acid in broiler feed can help improve the physiological status of livestock, which is reflected through the physiological response of livestock. The relationship between lauric acid and the physiological response of broilers includes better control of body temperature. However, under certain conditions, excessive lauric acid feeding may cause metabolic disorders. In addition, lauric acid plays an important role in improving the health of the chicken's respiratory tract and if too much can result in



metabolic overload and increased metabolic activity such as increased heart rate and respiratory frequency as the body's effort to regulate body temperature and oxygenation.

Research using products with high lauric acid content on the basis of DPKFA is still rarely done. Based on the description above, this study aims to study the effect of giving feed additive products with high lauric acid content on the health and productivity of broilers. The main focus of this study was to monitor changes in the physiological responses of livestock. It is hoped that the results of this study can provide a deeper understanding of the potential of lauric acid as a safe, effective, and sustainable alternative to AGP in improving broiler health and productivity.

MATERIALS AND METHODS

A. Research Materials

1) Feed Additive

The nutritional content of the feed additives used can be seen in Table 1

Table 1. Proximate Analysis and Fat Profile of Feed Additive Products

<i>Particular</i>	<i>Value (%)</i>
Dry Material (DM)	96,44
Ash	32,35
Crude Protein	0,93
Crude Fiber	0,56
Crude Fat	0,57
C12	39,185
C14	12,167
C16	15,443
C18:0	2,238
C18:1	17,732
C18:2	3,503
C18:3	0,110

2) Day Old Chick

The DOC used was 300 day old chick (DOC) of Lohmann strain broiler breed from PT Japfa Comfeed Tbk with body weight of 44.31 ± 2.5 g and diversity coefficient <10% which was reared for 35 days. Day Old Chick has been vaccinated against avian influenza, infectious bronchitis, and newcastle disease.

B. Research Methods

This research is a field research using the Complete Randomized Design (CRD) method. This study was divided into 6 treatment and each treatment consisted of 5 replicates and each replicate consisted of 10 broilers. The treatment groups in this study are as follows.

T0 : Basal feed (control)

T1 : Basal feed + zinc bacitracin 0,1% (positive control)

T2 : Basal feed + additive 0,05%



T3 : Basal feed + additive 0,10%

T4 : Basal feed + additive 0,15%

T5 : Basal feed + additive 0,20%

C. Research Variables

1) Rectal Temperature

Rectal temperature was determined using a rectal thermometer (Naas et. al. 2010).

2) Shank Temperature

The temperature of the shanks was measured by attaching a thermometer to the skin of the shanks for \pm two minutes (Zhou and Yamamoto, 2010).

3) Comb Temperature

The temperature of the comb was determined using an infrared thermometer (Naas et. al. 2010).

4) Respiratory Frequency

The calculation for respiratory frequency is done by counting the movement of the thorax for one minute (Yousef, 1985).

5) Heart Rate Frequency

To obtain the heart rate frequency, a stethoscope attached to the left chest can be used to listen to the heart rate of the chicken for 1 minute (Hartono et.al., 2002).

D. Statistic Analysis

This research is included in a complete randomized design (CRD) study with 6 treatments and 5 replicates. Data to be obtained include rectal temperature, shank temperature, comb temperature, respiratory frequency and heart rate frequency. The data obtained in this study will be tabulated by analysis of variance (ANOVA) using Microsoft Excel. If there is a difference in effect, it is continued with Duncan's Multiple Range Test (DMRT).

RESULT AND DISCUSSION

Table 2. Effect of Addition of Feed Additive Products Based on DPKFA (Distilled Palm Kernel Fatty Acid) with High Lauric Acid Content in Feed on the Physiological Response of Broilers

Parameter	Treatment					
	T0	T1	T2	T3	T4	T5
Rectal Temp. (°C)	40.3 \pm 1.02	40.3 \pm 0.84	40.3 \pm 0.79	40.3 \pm 0.76	40.3 \pm 0.96	40.3 \pm 0.86
Shank Temp. (°C)	37.7 \pm 1.72	37.9 \pm 1.44	38.2 \pm 1.72	37.8 \pm 1.37	37.9 \pm 1.44	37.7 \pm 1.34
Comb Temp. (°C)	36.8 \pm 0.74	36.7 \pm 0.55	37.0 \pm 0.88	36.6 \pm 0.68	36.9 \pm 0.99	36.7 \pm 0.93
Respiratory Freq. (times/min)	84.4 \pm 18.24	86.2 \pm 18.37	84.8 \pm 18.19	86.7 \pm 15.35	84.1 \pm 18.54	84.4 \pm 16.64
Heart Rate (times/min)	388.1 \pm 97.14	382.8 \pm 98.12	390 \pm 88.75	407.3 \pm 91.59	388.7 \pm 99.64	397.7 \pm 70.58

*Based on the research that has been done, the results obtained in the analysis of variance that the effect of the addition of lauric acid from DPKFA as a feed additive does not give a real effect ($P > 0.05$) on the physiological response of broilers.

A. Effect of Addition of DPKFA (Distilled Palm Kernel Fatty Acid) Based Feed Additive Product on Broiler Rectal Temperature

Based on Table 2, it is known that the addition of feed additive products based on DPKFA (Distilled Palm Kernel Fatty Acid) does not have a significant effect ($P > 0.05$) on rectal temperature. With the presence or absence of the addition of additive products, broilers are able to perform the thermoregulation process properly. In line with [3] that the rectal temperature of broilers tends to be stable and proves that joper chickens have a good thermoregulation system and can maintain optimal body temperature. The results of rectal temperature observations in the study tended to be normal, presumably lauric acid has a use to help the thermoregulation process in broilers. This statement is supported by [4] the provision of lauric acid in chicken feed shows an

increase in the chicken's immune system and reduces the negative impact of stress, which can have an impact on controlling chicken body temperature. By improving oxidative balance, lauric acid can help chickens survive thermal or environmental stress conditions. In the research of [5] stated that lauric acid has a positive influence on the optimization of broiler rectal temperature.

B. Effect of Addition of DPKFA (Distilled Palm Kernel Fatty Acid) Based Feed Additive Product on Broiler Shank Temperature

Based on Table 2, it is known that the addition of DPKFA-based feed additive products (Distilled Palm Kernel Fatty Acid) does not have a significant effect ($P > 0.05$) on shanks temperature. These results indicate that the shanks temperature is still categorized as normal. In line with Hidayat et al (2023) that the normal shanks temperature in broilers ranges from 37.67-38°C. The provision of additive products based on DPKFA (Distilled Palm Kernel Fatty Acid) with high lauric acid content is thought to play an important role in the thermoregulation process of broilers. According to [6] Lauric acid is one of the fatty acids that can function as an antimicrobial and immunomodulator so that it can play a role in maintaining the body stability of broilers. Shanks, as an organ that has many small blood vessels, allow the release of heat into the environment. This heat release is a response to sympathetic nerve stimulation to maintain body temperature through the shanks [7][8]. Based on the research data, there was no significant effect of treatment on broiler shanks temperature but the best treatments were P1 (control), P1 (positive control), P3, P4, and P5 because they were able to keep the shanks temperature stable and within the standard.

C. Effect of Addition of DPKFA (Distilled Palm Kernel Fatty Acid) Based Feed Additive Product on Broiler Comb Temperature

Based on Table 2, it is known that the addition of DPKFA-based feed additive products (Distilled Palm Kernel Fatty Acid) does not have a significant effect ($P > 0.05$) on comb temperature. The comb temperature range obtained in all treatments was in the range of 36.6-37°C and was classified as above standard. According to [9], normal comb temperature in broilers ranges from 38-41°C. Based on the results of the study, feed additive products with high lauric acid content were not able to provide a significant effect in maintaining the stability of comb temperature within the normal range. Chicken body regions such as the wattle, wing bars, comb, ears, eyes, and feet have few feathers or featherless which have temperatures that tend to be higher than feather-covered body regions such as the neck, head, wings, back, breast, underside, thighs, and tail. In the case of broilers, the surface temperature on the wings, head, back, and comb also increases as the ambient temperature increases. The addition of a DPKFA (Distilled Palm Kernel Fatty Acid) based additive product with a high lauric acid content has not had a significant effect on comb temperature. Because there are several other important factors that affect comb temperature including ambient temperature and humidity. The physiological mechanism that allows the comb and legs to evaporate heat occurs through changes in blood flow to the small blood vessels or capillaries in the comb and legs. This ability to regulate blood flow is due to the role of arterial-venous anastomosis (AVA) vessels that can respond to heat from the body and environment. An increase in body temperature and the environment causes the AVA vessels in the legs and comb to dilate. Some studies such as those conducted by [8][10][11] have suggested that body heat can be evaporated through blood vessel dilatation caused by the arterial-venous anastomosis (AVA) response, thus increasing blood flow. Overall, based on the research data, with the exclusion of environmental temperature factors, the provision of additives with high lauric acid does not have a positive effect in optimizing broiler comb temperature, additive products make the comb temperature of broilers relatively below the standard.

D. Effect of Addition of DPKFA (Distilled Palm Kernel Fatty Acid) Based Feed Additive Product on Broiler Respiratory Frequency Temperature

Respiratory frequency is the number of breaths counted from inhaling oxygen to expelling carbon dioxide which has units of breaths per minute. Respiratory frequency is calculated by counting the movement of the thorax for one minute. Normal respiratory frequency in broilers ranges from 20 to 40 times per minute [12]. Based on Table 2, it is known that the addition of feed additive products based on DPKFA (Distilled Palm Kernel Fatty Acid) with high lauric acid content in feed does not have a significant effect on the respiratory frequency of broilers ($P > 0.05$). In all treatments, either without or with additives showed that the breathing frequency ranged from 84.1 - 86.7 times per minute and tended to be above the standard, it is thought to be caused by several other factors outside nutritional factors such as environmental conditions and stress factors of broilers. This is in accordance with the high respiratory frequency in chickens can be caused by relatively high environmental temperature and humidity [13]. In another relevant study, lauric acid can help reduce inflammatory responses and oxidative stress, which in turn



can lower the level of inflammation in the respiratory tract. By improving respiratory tract function and reducing inflammation, the respiratory frequency of chickens can become more normalized. Lauric acid can reduce inflammatory load, potentially reducing stress-induced respiratory frequency.

E. Effect of Addition of DPKFA (Distilled Palm Kernel Fatty Acid) Based Feed Additive Product on Broiler Heart Rate Frequency

One indicator to identify changes in behavior and productivity in chickens is heart rate frequency. The normal range of heart rate frequency ranges from 250-470 beats per minute, and factors such as environmental temperature, feed, and muscle exercise activity can affect it [12]. Based on Table 2, it is known that the addition of feed additive products based on DPKFA (Distilled Palm Kernel Fatty Acid) with high lauric acid content in feed does not have a significant effect on the heart rate frequency of broilers ($P > 0.05$). In all treatments, with or without the addition of additives showed that the beat frequency ranged from 388-397 times per minute and could still be categorized under normal conditions. The addition of DPKFA (Distilled Palm Kernel Fatty Acid) based additive products with high lauric acid content has not had a significant effect on heart rate frequency. Because there are several other important factors that affect heart rate frequency including environmental temperature and humidity and stress conditions in broilers. On the other hand, according to [14] the use of lauric acid is proven to help reduce the frequency of heart rate increases due to stress, especially in chickens fed with a high lauric acid component. This suggests that lauric acid helps maintain the stability of the chicken's cardiovascular system.

CONCLUSION

The provision of feed additives from DPKFA (Distillate Palm Kernel Fatty Acid) did not have a significant effect on the physiological responses of broilers. Based on the results of the study by ruling out environmental factors, the provision of additive products is only able to make physiological responses more stable but not fully optimized holistically, especially in comb temperature which is at a temperature below the standard and respiratory frequency which tends to be below the standard.

REFERENCES

1. Gillespie, S. H. 2013. Antimicrobial resistance: A global perspective. *Clinical Infectious Diseases*, 56(1): 3-7. Tavel, P. 2007. *Modeling and Simulation Design*. AK Peters Ltd.
2. Wang J, Deng L, Chen M, Che Y, Li L, Zhu L, Chen G, Feng T. 2024. Phytogetic feed additives as natural antibiotic alternatives in animal health and production: A review of the literature of the last decade. *Anim Nutr*. 22(17) : 244-264.
3. Fatmaningsih, R., Riyanti, R., dan Nova, K. 2016. Performa Ayam Pedaging Pada Sistem Brooding Konvensional Dan Thermos. *Jurnal Ilmiah Peternakan Terpadu*, 4(3): 222-229.
4. Santos, A. L. R. 2016. Effect of dietary supplementation with lauric acid on performance, immunity, and intestinal health in broiler chickens. *Poultry Science*, 95(9), 2100-2107
5. Kowel, Y. H. S., Bagiu, A., dan Londok, J. J. M. R. 2022. Kecernaan In Vitro Pakan Broiler Yang Mengandung Level Asam Laurat Dan Serat Kasar Berbeda. *Zootec*, 42(1): 131-137.
6. Widianingrum. D. C., C. T. Noviandi and S. I. O. Salasia. 2019. Antibacterial and Immunomodulator Activities of Virgin Coconut Oil (VCO) Against *Staphylococcus aureus*. *Heliyon*. 5(10): 1-5.
7. Yanagi, T., Tsuda, T., Takahashi, T., and Chiba, S. 2002. Thermoregulatory Responses of Peripheral Tissue In Birds. *Journal of Thermal Biology*, 27(7): 569-572.
8. Yahav, S., Shinder, D., Tanny, J., Cohen, S., and Shlosberg, A. 2008. Thermal Manipulations During Broiler Chick Embryogenesis: Effects of Timing and Temperature. *Poultry Science*, 87(4): 845-850
9. Sturkie, P. D. (1986). *Avian Physiology*. Springer Science dan Business Media.
10. Tan, G. Y., Yang, L., Fu, Y. Q., Feng, J. H., and Zhang, M. H. 2010. Different Adaptation To Acute Heat Stres In Two Broiler Lines. *Poultry Science*, 89(4) : 783-791
11. Rahardja, D. P. 2010. The Role Of Arterio-Vena Anastomosis (AVA) In Heat Dissipation Mechanism In Broiler Chicken. In *International Seminar on Livestock Production and Veterinary Technology* . Vol. 2010: 352-356.
12. Narayanarao, T. 2015. *Poultry Farming*. New Delhi: PHI Learning Pvt. Ltd.



-
13. Hapsari, R. A., Sofyan, A., dan Murwani, R. 2016. Pengaruh Suhu Dan Kelembaban Terhadap Suhu Tubuh, Suhu Rongga Mulut, Frekuensi Pernapasan, Dan Denyut Jantung Ayam Kampung. *Jurnal Ilmu Ternak dan Veteriner*, 21(3): 134-141.
 14. Siddique, M. A. A., et al. (2015). Influence of lauric acid supplementation on broiler growth and feather development. *Journal of Poultry Science*, 52(1), 42-49.

Cite this Article: Ikhlas, M.N., Hamiyanti, A.A., Sjoffan, O. (2025). The Addition of Lauric Acid from DPKFA (Distilled Palm Kernel Fatty Acid) as A Feed Additive on The Physiological Responses of Broiler. International Journal of Current Science Research and Review, 8(7), pp. 3160-3165. DOI: <https://doi.org/10.47191/ijcsrr/V8-i7-01>