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The digestive organs of Kub chicken fed ration containing *Nutrigold* feed supplement

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Abstract

KUB chickens have the potential to serve as a source of meat to meet food needs, but they are still constrained by low growth rates. The use of local resources such as maggots, turmeric and spirulina as Feed Supplement "Nutrigold" is expected to play a role as a substitute for AGPs in the development of poultry farming. This study aims to determine the effect of adding Nutrigold Feed Supplement to commercial feed on the digestive organs of KUB chickens. The study used a completely randomized design (CRD) with four treatments and five replications. The treatments consisted of commercial feed supplemented with Nutrigold Feed Supplement as follows: P0 = 0% Nutrigold Feed Supplement; P1 = 1% Nutrigold Feed Supplement; P2 = 2% Nutrigold Feed Supplement; P3 = 3% Nutrigold Feed Supplement. The observed variables included the percentage of proventriculus, percentage of ventriculus, length of the small intestine, weight of the small intestine, percentage of the small intestine, length of the caecum, percentage of the caecum, length of the large intestine, and percentage of the large intestine. The results showed that the addition of 2-3% Nutrigold Feed Supplement to the commercial feed reduced the weight of the intestine in treatments P2 and P3 by 2.76% and 2.53%, respectively, and decreased the percentage of the small intestine in treatments P2 and P3 by 2.76% and 2.53%, respectively. However, for other variables, the addition of Nutrigold Feed Supplement was not able to significantly affect the digestive organs.

Keywords: Digestive organs; Feed Supplement; KUB Chicken; Local Resources; Nutri-Gold

1. Introduction

Countries in Southeast Asia, such as Indonesia, Malaysia, and Singapore, often rely on poultry like chickens to meet the protein needs of their populations. Chicken meat is consumed worldwide as a significant source of protein, and in some countries, it is much more affordable compared to beef, pork, or goat meat [1]. The KUB chicken (abbreviation for superior local chicken from Indonesia Agricultural research and development center "*Kampung Unggul Balitbangtan*") is a new breed of village chicken developed by the Agricultural Research and Development Center in Ciawi, Bogor. KUB chickens have several advantages, including resistance to avian diseases (such as Avian influenza), low mortality rates, efficient feed consumption, and high egg production with frequent daily laying [2];[3].

Village chickens are monogastric animals, and their digestive system is supported by various digestive organs, including the beak, oral cavity, esophagus, crop, proventriculus, gizzard, small intestine, large intestine, caecum, and cloaca, as well as accessory organs such as the liver, pancreas, and spleen [4]. The digestive system is a series of organs responsible for absorbing nutrients from feed so they can be utilized by the body's cells [5].

An alternative feed that can replace fishmeal and soybean meal is Nutrigold Feed Supplement, which is composed of several ingredients, including maggots, spirulina, and turmeric. Maggots, or larvae of the Black Soldier Fly (Hermetia illucens), contain 40-50% protein and essential amino acids [6]. According to [7], curcuminoid compounds have

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antibacterial properties that can improve the digestive process by eliminating harmful bacteria and stimulating the gallbladder to release bile, thereby enhancing fat metabolism. Spirulina platensis promotes the growth of lactic acid bacteria in the stomach, making it a prebiotic feed ingredient [8]. Providing high-quality Feed Supplements is believed to be able to improve and enhance the health of the digestive organs so that livestock productivity becomes better and can be a substitute for the use of AGPs which have been banned [9,10].

2. Material and methods

2.1. Cages

This study utilized 20 colony cages, each measuring 50 cm (length) x 50 cm (width) x 40 cm (height). The cages were constructed from wood and bamboo. Each cage unit was equipped with a feeder and a waterer. At the top of each cage unit, a 5-watt light bulb was installed to provide illumination at night and to help maintain a warm temperature inside the cage. The bottom of each cage was fitted with a droppings tray to facilitate the cleaning of chicken waste throughout the duration of the study.

2.2. Kub Chicken

This study used 60 KUB chickens aged 1 week, with a homogeneous body weight of 65.20 ± 0.34 grams

2.3. Experimental Design

The study used a completely randomized design (CRD) with four treatments and five replications. Each treatment unit consisted of 3 chickens. The treatments were as follows: P0= 0% Nutrigold Feed Supplement; P1= 1% Nutrigold Feed Supplement; P2= 2% Nutrigold Feed Supplement; P3= 3% Nutrigold Feed Supplement.

2.4. Randomization of KUB Chickens

In this study, 60 KUB chickens were weighed to determine the average weight (standard deviation: 65±0.34 g). After obtaining the average body weight and standard deviation, the chickens were randomly placed into 20 cages, with 3 chickens per cage.

2.5. Feed and Water Provision

The feed given to the KUB chickens was CP 511B and Nutrigold. The feed was provided according to the treatment. Feed and water from PDAM were provided ad libitum, given in the morning and evening.

Nutrigold Feed Supplement, Feed, and Drinking Water

The nutrient content of Nutrigold Feed Supplement and CP 511B feed is detailed in Table 1, while the nutrient content of the treatment feed is outlined in Table 2. The drinking water used in the study was sourced from the Local Water Supply Company (PDAM).

Table 1 Nutrient content of Nutrigold Feed Supplement and CP 511B feed

Nutrient Contents	**Nutrigold [1)]**	**CP 511B**
Gross Energy (GE)	6203 Kcal/kg	3961 Kcal/kg [3)]
Crude Protein	54.3 %	20 % [2)]
Crude Fiber	6.7 %	5.0 % [2)]
Crude Fat	33.6 %	5.0 % [2)]
Ash	4.9 %	8 % [2)]
Moisture	3.7 %	14 % [2)]

Notes:[1]Analysis result of Laboratory of Nutrition and Animal Feed, Faculty of Animal Husbandry, Udayana University (2023); [2.] Nutrient composition of PT. Charoen Pokphand (2013); [3]Analysis result of Laboratory of Nutrition and Animal Feed, Faculty of Animal Husbandry, Udayana University (2022)

Table 2 Nutrient content of the treatment feed

Nutrient Composition	Treatment [1)]				SNI Standard
	P0	P1	P2	P3	
Moisture (%)	14	13.90	13.79	13.69	14
Ash (%)	8.0	7.97	7.94	7.91	8.0
Crude Protein (%)	20	20.34	20.69	21.03	20
Fat /ether extract (%)	5.0	5.29	5.57	5.86	3.0
Crude Fiber (%)	5.0	5.02	5.04	5.05	7.0
Gross Energy/GE (kcal/kg)	3961	3983.42	4005.84	4028.26	-

Notes: P0= 0% Nutrigold Feed Supplement; P1= 1% Nutrigold Feed Supplement; P2= 2% Nutrigold Feed Supplement; P3= 3% Nutrigold Feed Supplement.

2.6. Maintenance

Before the KUB chickens were placed in the cages, the cages and equipment were prepared, and the cages were sanitized to prevent disease. The chickens were given a sugar water solution in the waterer to boost their energy, which was replaced with regular water after 4 hours. Feed and water provision were monitored daily throughout the study.

2.7. Sampling

Sampling of the KUB chickens was conducted after the maintenance period ended. The chickens selected for sampling were those with body weights closest to the average in each experimental unit.

2.8. Observed Variables

The variables observed in this study were: Percentage of proventriculus, Percentage of ventriculus, Percentage of small intestine, Percentage of caecum, Percentage of large intestine Weight of small intestine, Length of small intestine, Length of caecum, and Length of large intestine. The data obtained is calculated using the following formula [11]

2.9. Data Analysis

The data from this study were analyzed using Analysis of Variance (ANOVA). If there were significant differences between treatments ($P<0.05$), the analysis was followed by Duncan's Multiple Range Test [12].

3. Results and discussion

The data from the study on the effect of Nutrigold supplementation in commercial feed on the digestive organs of 8-week-old KUB chickens can be seen in Table 3.

The percentage of proventriculus in this study ranged from 0.45-0.51% (Table 3). This is likely due to the commercial feed used during the study, which had a balanced and optimal nutrient composition, promoting the growth of the proventriculus.

The percentage of ventriculus ranged from 2.30-2.38% (Table 3). This is also attributed to the high-quality commercial feed, which supported the optimal development of the ventriculus.

The weight and percentage of the small intestine ranged from 24.30-27.43 g and 2.53-3.19%, respectively (Table 3). This is likely due to the essential oils in Nutrigold Feed Supplement, which may enhance intestinal relaxation and reduce peristaltic movements [13]. Additionally, the antimicrobial peptides (AMP) in maggots can inhibit the growth of pathogenic microbes, supporting the development and health of the small intestine [9,14]. The presence of AMP in maggots may also prevent thickening of the intestinal walls due to infections caused by pathogenic microbes, keeping the weight of the small intestine normal and preventing excessive weight gain from intestinal wall thickening. [15] states that the length, thickness, and weight of the digestive tract in poultry are not static. Changes can occur during development due to the type of feed provided. Feed high in fiber can alter the size of the digestive tract, making it heavier, longer, and thicker [10].

The percentage of caecum ranged from 0.72-0.75% (Table 3). This is likely due to the presence of lactic acid bacteria (LAB) such as Lactobacillus and Bacillus subtilis in maggots and spirulina in the feed. An increase in LAB population produces more short-chain fatty acids, lactic acid, and antimicrobial substances. The increase in weight and length of the caecum is supported by the increased activity of LAB, which suppresses the growth of Escherichia coli. A decrease in Escherichia coli population creates a healthier environment, facilitating the digestion of coarse fiber fermented by cellulolytic bacteria in the caecum [9,10,16]. This study proves that the feed supplemented with Nutrigold does not affect the function and performance of the caecum.

Table 3 Effect of Nutrigold supplementation in feed on the digestive organs of 8-week-old KUB chickens

Variable	**Treatment** [1)]				**SEM**[3)]
	P0	**P1**	**P2**	**P3**	
Percentage of pro-ventriculus	0,45[a2)]	0,46[a]	0,48[a]	0,51[a]	0,02
Percentage of ventriculus	2,30[a]	2,34[a]	2,35[a]	2,38[a]	0,05
Percentage of small intestine	3,19[a]	3,09[a]	2,76[b]	2,53[c]	0,06
Percentage of caecum	0,75[a]	0,74[a]	0,72[a]	0,72[a]	0,02
Percentage of large intestine	0,15[a]	0,16[a]	0,17[a]	0,18[a]	0,02
Weight of small intestine (g)	27,43[a]	27,05[a]	25,95[b]	24,30[c]	0,22
Length of small intestine (cm)	104,20[a]	105,20[a]	108,50[a]	111,50[a]	2,42
Length of caecum (cm)	25,50[a]	26,40[a]	26,40[a]	26,60[a]	0,45
Length of large intestine (cm)	6,00[a]	6,20[a]	6,20[a]	6,50[a]	0,30

Notes: P0= 100% commercial feed + 0% Nutrigold Feed Supplement; P1= 99% commercial feed + 1% Nutrigold Feed Supplement; P2= 98% commercial feed + 2% Nutrigold Feed Supplement; P3= 97% commercial feed + 3% Nutrigold Feed Supplement; Values with different superscripts in the same row are significantly different ($P<0.05$); SEM: Standard error of the treatment means.

The percentage of the large intestine ranged from 0.15-0.18% (Table 3). This is attributed to the balanced nutrient content of the commercial feed, which supported the optimal growth of the large intestine.

The length of the small intestine ranged from 104.20-115.50 cm (Table 3). This is due to the high-quality commercial feed, which promoted the optimal growth of the small intestine. However, quantitatively, the addition of Nutrigold at levels of 1-3% showed a trend of increasing the length of the small intestine by 0.95% (P1), 4.16% (P2), and 14.68% (P3) compared to the control (P0). This is likely due to the essential oils in Nutrigold Feed Supplement, which may enhance intestinal relaxation and reduce peristaltic movements (Solichedi *et al.,* 2003), and the antimicrobial peptides (AMP) in maggots, which can inhibit the growth of pathogenic microbes, supporting the development of the small intestine [9, 14].

The length of the caecum ranged from 25.50-26.60 cm (Table 3). This is due to the high-quality commercial feed, which promoted the optimal growth of the caecum. However, quantitatively, the caecum showed a trend of increasing length by 3.52% (P1), 3.52% (P2), and 4.31% (P3) compared to the control (P0). This is likely due to the presence of lactic acid bacteria (LAB) such as Lactobacillus and Bacillus subtilis in maggots and spirulina in the feed. An increase in LAB population produces more short-chain fatty acids, lactic acid, and antimicrobial substances. LAB also produces antimicrobial substances (bacteriocins) that combat the growth of pathogenic bacteria and promote beneficial bacteria in the small intestine [1,9,10]. The increase in caecum length is supported by the increased activity of LAB, which suppresses the growth of Escherichia coli. A decrease in Escherichia coli population creates a healthier environment, facilitating the digestion of coarse fiber fermented by cellulolytic bacteria [9,10].

The length of the large intestine ranged from 6.00-6.50 cm (Table 3). This is due to the high-quality commercial feed, which promoted the optimal growth of the large intestine.

4. Conclusion

Based on results of the study, it can be concluded that the addition of 2-3% Nutrigold to commercial feed reduced the weight and percentage of the small intestine but did not significantly affect the proventriculus, ventriculus, caecum, large intestine, or their lengths.

Compliance with ethical standards

Disclosure of conflict of interest

We certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

References

[1] Azhar, M. 2009. Inulin as a Prebiotic. Sainstek 12 (1):1-8. Available from: https://media.neliti.com/media/publications/128847-ID-inulin-sebagai-prebiotik.pdf

[2] Sartika, T. 2016. Harvesting Village Chickens in 70 Days. Penebar Swadaya Group.

[3] Suryana, S. 2017. Development of Superior Village Chickens (KUB) in South Kalimantan. Jurnal War. 27: 45-52. Available: https://repository.pertanian.go.id/items/c27462fb-fefb-45f8-b03f-1795f17725c1

[4] Suprijatna, U.A. 2005. Basic Science of Poultry. Jakarta: Penebar Swadaya.

[5] Kompiang, IP. 2009. Utilization of Microorganisms as Probiotics to Improve Poultry in Indonesia. Center for Research and Development in Animal Husbandry. Bogor.

[6] Wardhana, A.H. 2016. Black Soldier Fly (Hermetia illucens) as an Alternative Protein Source for Animal Feed. Wartazoa. 26(2): 69-78.

[7] Darwis, S. N., A. B. D. Modjo Indo, and S. Hasiyah. 1991. Medicinal Plants of the Zingiberaceae Family. Agricultural Research and Development Agency. Bogor. http://dx.doi.org/10.14202/vetworld.2019.402-408

[8] Parada, J. L., de Caire, G. Z., de Mulé, M. C. Z., and M. M. S. de Cano. 1998. Lactic Acid Bacteria Growth Promoters from Spirulina platensis. International Journal of Food Microbiology. 45(3): 225-228. DOI: 10.1016/S0168-1605(98)00151-2

[9] Mudita, I.M., I.B.G. Partama, I.N.S. Sutama, I.W. Suberata and I.N.T. Ariana, 2023. Utilization of lignocellulolytic probiotic bacteria consortium as microbial protein. Pakistan Journal of Nutrition. 22: 81-87. https://scialert.net/abstract/?doi=pjn.2023.81.87

[10] Mudita, I Made, I Wayan Sukanata, Ida Bagus Gaga Partama. I Nyoman Sutarpa Sutama. 2020. Probiotik Bakteri Lignoselulolitik "Probio-BaliTani" Pengganti AGPs Peternakan Broiler (in Indonesian). Probiotic of Lignocellulolytic Bacteria "Probio-BaliTani" AGPs Substitute for Broiler Farming. Book. Swasta Nulus joint of Faculty of Animal Husbandry, Udayana University, ISBN: 978-623-7559-95-5. Denpasar, Bali Indonesia

[11] Darwis, S. N., A. B. D. Modjo Indo, and S. Hasiyah. 1991. Medicinal Plants of the Zingiberaceae Family. Agricultural Research and Development Agency. Bogor. http://dx.doi.org/10.14202/vetworld.2019.402-408

[12] Steel, R.G.D., and J.H. Torrie. 1993. Principles and Procedures of Statistics: A Biometrical Approach. Translated by B. Sumantri. Gramedia Pustaka Utama, Jakarta.

[13] Solichedi, K., U. Atmomarsono, and V. D. Yunianto. 2003. Utilization of Turmeric (Curcuma domestica Val) in Broiler Diets to Reduce Abdominal Fat and Blood Cholesterol Levels. JITAA. 28(3): 172-178. DOI: 10.31186/jspi.id.15.3.273-279

[14] Harlystiarini. 2017. Utilization of Black Soldier Fly (Hermetia illucens) Larvae Meal as a Protein Substitute for Fish Meal in the Diet of Laying Quails (Coturnix coturnix japonica). Nutrition and Feed Science: Bogor Agricultural University.

[15] Amrullah, I.K. 2003. Broiler Chicken Nutrition. Bogor: Lembaga Satu Gunungbudi.

[16] Winarsih, W. 2005. The Effect of Probiotics in Controlling Subclinical Salmonellosis in Chickens: Pathological and Performance Aspects. Dissertation. Postgraduate Program, Bogor Agricultural University, Bogor.