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THE PROTEIN DIGESTIBILITY OF THE BROILER CHICKENS FED JAMU FORMULA, a LOCAL HERBAL SOLUTION

Rusny RUSNY[1], Muhammad Nur HIDAYAT[1], Ummi KALSUM[1] and Mashuri MASRI[2*]

[1]*Department of Animal Husbandy, Faculty of Science and Technology, State Islamic University Alauddin Makassar, South Sulawesi, Indonesia*
[2]*Department of Biology, Faculty of Science and Technology, State Islamic University Alauddin Makassar, South Sulawesi, Indonesia*

Email: mashuri.masri@uin-alauddin.ac.id; ORCID: 0000-0003-1148-7208

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ABSTRACT: Jamu (local herbal drinking) have been known for a long time by inhabitants in Indonesia as conventional home grown pharmaceutical and to progress digestion system within the body. Jamu, not as it were for people but also for creatures. Local farmers have moreover utilized jamu for chicken for a long time, and it's utilize is expanding. This Research points to decide the impact of jamu to extend protein *in vivo* digestibility in broilers and for knowing the ideal level of jamu for optimum protein digestibility in broilers. The strategy utilized in this investigate is Completely Randomized Design (CRD) with 4 treatment and 5 replications, each redundancy comprises of 1 broiler chickens, so there are 20 chickens. The treatment comprises of P0 (control), T1 (jamu 1.5 mL/500 mL), T2 (jamu 2.5 mL/500 mL) and T3 (jamu 3.5 mL/500 mL). The parameters watched were digestibility protein in broilers. Based on the examination of fluctuation, it appears The treatment had no critical impact on chicken protein broilers' digestibility given jamu. However, seeing each treatment's average value, T1, T2 and T3 tend to increase to 99.62%, 99.68% and 99.71%, respectively. In conclusion, supplemented with jamu formula does not significantly affect broiler chicken protein's digestibility, but the digestibility increases with increasing formula, up to the formula 3.5 mL/500 mL (T3) as the ideal level.

Keywords: Broiler, Digestibility, Herbal treatment, Jamu, Protein.

INTRODUCTION

The demand for chicken meat increases along with increasing incomes and awareness of the importance of animal protein (Wilkie, 2005). Developing broiler production, and provide commercial feeds has fulfilled legal needs for farmers (Variani et al., 2017). Despite the price relatively expensive because some of the ingredients are still imported, some commercial feed ingredients are widely available and easy to obtain. Besides, it contains additional feed ingredients (feed additives) needed by livestock (Alqaisi et al., 2017).

Protein is a necessity nutrient for humans and livestock to be affect the growth period, age, physiology, production, and body condition. Protein digestibility is the ability of the protein to be hydrolyzed into amino acids by digestive enzymes (Hou et al., 2017). If protein digestibility is high, the protein can be well hydrolyzed into amino acids, so the number of amino acids that can be absorbed and used by the body sufficiently (Ketnawa and Ogawa, 2019). If the protein digestibility is a combined process to be hydrolyzed into amino acids then the amount Amino acids that can be absorbed and used by the body are in low rate due in part large will be disposed of by the body with feces (Deb-Choudhury et al., 2018). Its well-known, protein is very important in tissue repair energy metabolism and for obtaining vital substances in body functions such as enzymes (Shah et al., 2020).

Herbal formulation (Jamu) have been known for a long time by residents in Indonesia as traditional medicine and to improve metabolism in the body (Elfahmi et al., 2014). Jamu has been used for special targets not only for humans (Mosihuzzaman, 2012; Zhu, 2020) but also for animals (Alagawany et al., 2019; Zhu, 2020). Local farmers have also used jamu for chicken for a long time, and its use is increasing (Gaucher et al., 2015; Galli et al., 2020). Based on information in the field, some breeders who use jamu can increase their livestock productivity, for example Galli's research fed jamu in breeders which increase quality of meat in fatty acid profile (Galli et al., 2020).

Agustina et al. (2017) showed that jamu in liquid or powder form can inhibit Gram-positive and Gram-negative bacteria, because the ingredients contain bioactive substances. It was necessary to reduce the types of materials suspected of having the same bioactive substances. The use of jamu in liquid form as much as 2.5 mL/L of drinking water, is the best result of performance and histopathological abnormalities of internal organs. The use of 0.15% herbal concoction powder in feed effectively improves performance, reduces the number of deaths, abdominal fat, blood cholesterol, and gives the highest OD (Optic Density) value, which indicates that herbal concoction powder can prevent viruses (using a lubricant kit to test IFNγ (Interferon-gamma). Based on this description, it is necessary to conduct a

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research on the use of herbal medicine in drinking water to determine the effect protein digestibility in broilers. Aim of present study was to determine the effect of jamu to expand protein *in vivo* digestibility in broilers and for knowing the perfect level of jamu for ideal protein digestibility in broilers

MATERIALS AND METHODS

The materials used in this study were 40 broilers, husk, and herbal solution with 250 g of a mixture of ingredients, namely garlic (*Allium sativum* L.), leaves betel (*Piper betle* L.), cinnamon (*Cinnamomum verum* L.), EM-4 (Effective Microorganisms-4) and molasses. The feed used comes from a commercial feed, namely B11A with the composition of corn, rice bran, soybean meal, fish meal, meat bone meal, corn gluten meal, pollard, stone flour, crude palm oil, sodium bicarbonate premix, vitamins and trace minerals. While the material used to calculate digestibility protein, namely sample (feces), selenium ± 1 gram, 25 mL concentrated H_2SO_4, distilled water 100 mL, 10 mL 2% H_3BO_3, 4 drops indicator solution and 10 mL 30% NaOH.

Research design

This study used a completely randomized design (CRD) consisting of 4 treatments and 5 replications, each replication consisted of 2 broilers so that there are 40 experimental units with treatment (T), namely: T0: control; T1: Jamu 1.5 mL/500 mL/drinking water; T2: Jamu 2.5 mL/500 mL/drinking water; T3: Jamu 3.5 mL/500 mL/drinking water.

Broiler preparation and maintenance

The cage must be prepared before day old chick (DOC) entered, cage preparation is done carefully and carried out to install curtains and cleaning and sterilization around the cage with how to spray detergent and the tools to be used and wait until dry. After that, it is covered with husks with a thickness of seven cm feed, and the area of the cage unit used is 60 × 100 cm. Preparations are maintained from DOC until the age of 30 days with a cage covered with husks. The treatment is given to chickens since the chicken entered the cage unit experiment until harvest. The number of treatment chickens was 40 chickens selected randomly and put into the cages of each experimental unit 2 tails. Each experimental unit enclosure is equipped with a 25 watt incandescent lamp as many as 20 pieces.

Production of Jamu

Materials used to manufacture herbal such as garlic, betel leaf, cinnamon first cleaned, then weighing 250 g each, then crushed use a blender for garlic and betel leaves, except for cinnamon ground using a mortar until smooth. Next third, the ingredients are mixed in one container. Addition of molasses and EM-4 (effective microorganisms-4) was also carried out each as much 1 L then add 10 L of water. Stir until all ingredients to be homogeneous (Jamili et al., 2014).

Table 1 - Ingredients of Jamu used in present study.

Ingredients	Composition
Garlic	250 g
Betel leaf	250 g
Cinnamon	250 g
EM-4	1 L
Molasses	1 L
Well water	10 L

Source: Primer Data.

Table 2 - Energy content of B11A feed used in present study.

Content	Composition (%)
Water	13.0
Protein	22.0-23.5
Fat	5.0
Fiber	5.0
Ash	7.0
Calcium	0.9
Phosphorus	0.6

Source: PT. New Hope Indonesia, 2019

Feed and drinking water

Feeding is done a few hours after drinking DOC (3-4 hours after the DOC is drinking). The provision of drinking water is carried out *ad libitum* (continuously), and in giving it must be clean and fresh, and the drinking water has been mixed with the herbal herbs that are given each day until the age of 30 days, and the giving is done according to treatment that has been determined in this study. The nutritional content of commercial feed B11A produced by PT. New Hope Indonesia is used in this study is presented in Table 2.

Protein digestibility calculation process

After going through the maintenance process, at the end of the study, fecal samples were taken from each treatment in the form of fresh ones that had been weighed previously to determine their fresh weight for further observation in the laboratory by the method of calculating protein digestibility, namely by weighing carefully weighing ± 0, 5 g of the sample, then put it in the Kjeldahl flask. A mixture of selenium (±1 g) and 25 mL of concentrated H_2SO_4 was added. The Khjedhal flask and its contents were shaken until all samples were wetted with H_2SO_4 then digested in a fume

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hood until it was clear. Let it cool, then pour into a 100 mL volumetric flask and rinse with distilled water. Let it cool again, squeeze it to the mark with distilled water and then shook it until it was homogeneous. After that, a pan consisting of 10 mL H_3BO_3 2% + 4 drops of mixed indicator solution prepared into Erlenmeyer, then Pipette 5 mL of sample solution into a distillation flask, add 10 mL of 30% NaOH and 100 mL of distilled water. Then it was distilled until the reservoir volume became ± 50 mL. Rinsed the distiller's end with distilled water, then the container and its contents were titrated with a 0.0171 N H_2SO_4 solution (Adedokun et al., 2008).

$$\%\,CrudeProtein = \frac{VxNx14x6.25xP}{sampleweight(gr)} \times 100\%$$

Description: V: volume of sample titration; N: normality of H_2SO_4 solution; P: dilution factor.

Protein digestibility test by taking 1 sample from each test

Observation of protein digestibility by knowing the data on feed consumption that has been added with herbal herbs to drinking water and weighing the feces in the ileum. The collection method of ileal digesta is by fasting for 14 hours. It is given commercial feed as much as 100 g/head and drinking water for 10 hours before slaughtering after being fast. Then the chicken is slaughtered. Digesta was taken from the small intestine part of the ileum, after 1 cm from Meckel's diverticulum to a limit of 1 cm before the ileum-cecal junction. After that, the digesta is removed, and then the initial weight is weighed in fresh form from each treatment. After that, the digesta was collected and then analyzed *in vivo* (Adedokun et al., 2008). According to Li et al. (2017), regarding the digestibility calculation method protein, namely the following formula:

$$\%ProteinDigestibility = \frac{(\Sigma Ax\%B) - (\Sigma Cx\%D)}{(\Sigma Ax\%B)} \times 100\%$$

Description: A: consumption of ration (g); B: food substances in the ration (protein, %); C: number of feces (g); D: food substance in feces (protein; %).

Statistical analysis

The data obtained will be analyzed through variance using a completely randomized design (CRD) with 4 treatments and 5 replications. If the treatment has a significant effect, then the Duncan multiple area test is continued to see the differences in each treatment sample. According to Ervina et al. (2019) the mathematical model of the CRD is as follows:

Y ij = μ + αi + € ij

Description: Yij: The observed value of the i^{th} treatment of jamu; μ: Real average value; αi: effect of treatment at level I; € ij: error; i: T0, T1, T2, T3 (treatment); j: 1, 2, 3 (repeat).

Ethical approval

The *in vivo* study was supervised by The Animal Ethics Committee of the Universitas Islam Negeri Alauddin and conducted in accordance with the basic animal husbandry and health protocols referred to in Legislation of the Republic of Indonesia No. 18, 2009.

RESULTS AND DISCUSSION

The results of the 23 days feeding jamu-treatment against protein digestibility in the cobb-500 broiler chicken presented in Table 3. The results of this analysis of variance indicated that the treatment has not significant effect (P>0.05) on protein digestibility. The treatments were T0 (99.56%), T1 (99.62%), T2 (99.68%) and T3 (99.71%).

Protein digestibility is the amount of protein that is absorbed from food into particles absorbed by the digestive tract (Jonker and Yu, 2017; Cholis et al., 2018). In Table 3, the average value of T3 (99.71%), which is given herbal herbs in chicken drinking water as much as 3.5 mL, showed the value of protein digestibility as the highest among other treatments. In comparison, the lowest average protein digestibility value was P0 (99.56%) of all treatments. The treatment statistically has no significant effect on protein digestibility, but seen from the trend of research data, the feed of jamu with a dose of 3.5 mL can increase protein digestibility, this treatment has the highest value of all treatments with a value of 99.71%. Alagawany et al. (2019) stated that cattle that consume high protein could affect their body cells' metabolism to run correctly.

Table 3 - Average digestibility and standard deviation of protein in broiler chickens fed jamu for 23 days.

Variable	Treatment				P-value
	T0	T1	T2	T3	
Protein digestibility	99.56±0.95	99.62±0.15	99.68±0.13	99.71±0,07	0.24

T0 = Control. T1 = Jamu 1.5 mL/500 mL/drinking water. T2 = Jamu 2.5 mL/500 mL/drinking water. T3 = Jamu 3.5 mL/500 mL/drinking water. ±(standard deviation).

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In the present study, the treatment given was in the form of jamu from several ingredients such as garlic, betel leaf, and cinnamon which had almost the same content as alicin, essential oils, flavonoids, tannins (Castillo-López et al., 2017; Alagbe et al., 2020), it's were able to increase protein digestibility in broilers and could be antibacterial (Alagawany et al., 2019; Alagbe et al., 2020). The working system of feeding jamu in livestock, which can improve metabolism, the digestive system and reduce pathogenic bacteria that can affect feed consumption absorption (Alagawany et al., 2019). Reduced pathogenic bacteria in the digestive system of livestock so that the protein also produced increases (Galli et al., 2020).

All ingredients' content works following their respective mechanisms that interfere with and even damage pathogenic bacteria so that their growth is blocked or dies (Alagawany et al., 2019; Galli et al., 2020). According to Castillo-López et al. (2017), alicin is one of the most active biological components in garlic (Castillo-López et al., 2017). Previously, Cardoso-Ugarte et al. (2016) argued that cinnamon's content has many compounds, namely essential oils (Cardoso-Ugarte et al., 2016). According to Jamili et al. (2014) when the betel leaf, garlic, and betel leaf are all mixed, it will have a robust inhibitory compound against *Staphylococcus aureus* and *Salmonella thypi* bacteria, namely tannins, essential oils, alisin, flavonoids, etc. which have their way to inhibit bacteria.

The contents of the materials used which have antibacterial properties work according to their respective mechanisms, for example, flavonoids, tannin alkaloids, and essential oil, which work to form more complex compounds then disrupt and even damage the test bacterial cell membranes so that the bacterial life activity is inhibited or dies (Alagbe, et al., 2020; Galli et al., 2020). Previously, Cheng et al. (2014) and Rabinowitch (2002) stated that allicin could inhibit the growth of negative and positive gram bacteria, and prevent abnormalities in the small intestine to better the intestine's protein absorption process (Cheng et al., 2014; Rabinowitch, 2002). The effect of this study was not significant ($P>0.05$) because it could be caused by several factors such as provision of feed, bulkhead conditions, environmental conditions, provision of drinking water added with jamu in each treatment. According to Dersjant et al. (2015) and Olijhoek et al. (2018), the high and low digestibility of feed ingredients is influenced by several factors, including types of livestock, feed, types of feed ingredients in rations, crude protein content, and the way of providing rations, however this also shows that one of the factors that makes it insignificant is the amount of broiler consumption influenced by the form of feed and the protein content of the feed (Dersjant-Li et al., 2015; Olijhoek et al., 2018).

In present research, the form of feed used is commercial feed produced in pelleted form. According to Milanovic (2018), good feed for broilers such as pellets and crumble is because poultry has high palatability to add to its digestibility, poultry feed dramatically determines the level of protein digestibility so that the amount of feed and protein content that enters the digestive tract (Milanovic, 2018). The protein content in the feed used in each treatment was an average of 22.75% from the starter-finisher period. Kaewtapee et al. (2017) and Olijhoek et al. (2018) stated that rations with low protein content generally have low digestibility and vice versa. The level of protein digestibility depends on the protein content of the feed ingredients, the amount of protein that enters the digestive tract, and the influence of the use of doses of antibiotics and probiotics given (Liao and Nyachoti, 2017; Clavijo and Flórez, 2018; Galli et al., 2020; Zaghari et al., 2020). The addition of doses from each treatment also dramatically determines the effect on the digestibility of the protein itself, the doses used in this study started from T1, T2, and T3 treatments, respectively, namely 1.5 mL/500 mL/drinking water, 2.5 mL/500 mL/drinking water and 3.5 mL/500 mL/drinking water, following the research of Kusbiyantari et al. (2017) which uses a betel leaf solution with a dose of 5% per liter of drinking water to increase protein digestibility.

CONCLUSION

The feeding of jamu had no significant effect on digestion of protein in broilers. T1, T2 and T3 tend to increase; 99.62%, 99.68% and 99.71%, respectively. In summary, supplementation with jamu does not essentially influence broiler chicken protein's digestibility, but the digestibility increments with expanding equation, up to 3.5 mL/500 mL (T3) as the ideal level. Further studies with other local herbs and herbal solutions are suggested.

DECLARATIONS

Corresponding Author
E-mail: mashuri.masri@uin-alauddin.ac.id; ORCID: 0000-0003-1148-7208

Authors' Contribution
All authors contributed in research and writing, equally.

Conflict of Interests
The authors declare that they have no competing interests.

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