

## **The effect of supplementation perilla seeds (*Perilla frutescens*) in the diets on feed consumption and digestibility nutrients on ducks**

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**ABSTRACT:** This study aims to determine the digestibility of perilla seeds (*Perilla frutescens*) in 3 levels (0, 2.5, and 5%) in rations given to local ducks. The research material used was male Mojosari ducks (Day Old Duck) with as many as 90 tails, with an average initial body weight of 35.36 grams. The ration consists of ground corn, pollard, fine bran, soybean meal (SBM), vitamin premix, and perilla seed supplementation. Livestock was separated by three treatments, P0: 100% basal ration without supplementation of *Perilla frutescens* L seeds; P1: 97.5% basal ration + 2.5% supplementation of *Perilla frutescens* L. seeds; P2: 95% basal ration + 5% supplementation of *Perilla frutescens* L. seeds. Duck ducks are kept for two months. The variables observed were crude protein digestibility, crude fat, crude fiber, and organic matter. The results showed a very significant effect ( $P < 0.05$ ) on the digestibility of crude protein, crude fat, and crude fiber and an insignificant effect ( $P > 0.05$ ) on the digestibility of organic matter and feed consumption. Supplementation of perilla seeds can increase the digestibility of fat and fiber but decreases protein digestibility.

**Keywords:** Perilla seeds; Duck; Nutrient digestibility; Feed consumptions; Supplementation

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## **INTRODUCTION**

In Indonesia, ducks are generally cultivated as a producer of eggs, but some are cultivated as a producer of meat. The population of ducks in Indonesia in 2015 was 46,875,000, experiencing growth of 3.55% from the previous year, while meat production was 34.54 tons (DJPKH, 2018). The feed is anything from organic or inorganic ingredients that can be partially or wholly digested (Anggorodi, 1995). Information on nutritional requirements for local broiler ducks is relatively different from broiler chickens that have been widely published, as reported by several researchers (Bouvarel et al., 2004; Hurwitz et al., 1998; Kamran et al., 2008). The growth of local male ducks will be more optimal if supported by good feed. The amount of ration consumption strongly influences the value of crude protein digestibility in the ration. The higher the ratio consumption, the higher the protein digestibility value (Maghfiroh et al., 2012).

*Perilla frutescens* (L.) Britt. (Lamiaceae) Moreover, its varieties are plants that can be consumed and used as medicines in Asian countries such as China, Korea, Japan, and Thailand (Asif & Kumar, 2010). The antioxidant compounds in perilla seeds include phenolic acids (for example, rosmarinic acid), flavonoids, and triterpenoids (Hong & Kim, 2010). The amount of Prifrucens (*Perilla Frutescens* L.) oil formed is approximately 40% by weight of the seeds, where the main composition consists of palmitic acid (C16: 0); stearic acid (C18: 0); oleic acid (C18: 1n-9); linoleic acid (C18: 2n-6), and omega-3 (Peiretti et al., 2011); (Lee et al., 2013). This oil also contains 6.7-7.6% saturated fatty acids. In addition, perilla seeds are often used as animal and poultry feed (Narisawa et al., 1994; Zekonis et al., 2008). The nutrient content of perilla seeds contains 25.01% protein, 3457.55 Kcal/kg metabolic energy, 43.1% fat, 29.83% crude fiber, 2.49% calcium, and 2.031% available phosphorus (Hadi & Sudiyono, 2019).

Digestibility is the difference between food substances consumed and those excreted in feces or excreta and considered absorbed in the digestive tract. The high and low digestibility of feed ingredients means how much the feed ingredients contain nutrients in a form that can be digested in the digestive tract (Tillman et al., 1998). The feed consumed by livestock will affect consumption, feed digestibility, body weight gain, adult sex, egg production, and the quality of the eggs produced (Irawan et al., 2012).

These results indicate that using rations supplemented with perilla seeds effectively reduces the saturation, atherogenic and thrombogenic indexes in monogastric livestock tissue (Peiretti et al., 2011). However, in perilla seeds, anti-nutritional compounds can affect the digestibility of nutrients, namely tannins 0.672% and phytic acid 0.817% (Liu, 2008). Adding *Perilla* seeds can improve the meat's quality and not adversely affect growth yield and carcass characteristics (Deng et al., 2017).

*Perilla* seeds can be added in the form of a ration supplement and can change the composition of fatty acids in animal products (Deng et al., 2018). *Perilla* seeds can be used as a protein source in animal feed, the seeds contain a small amount of oil. Therefore, this study aims to determine the effect of perilla seed supplementation on the ratio of nutrient digestibility of local ducks.

## **MATERIALS AND METHODS**

### **Preparation of Perilla seed meal**

The process of making perilla seed flour begins by washing the perilla seeds using running water until they are clean, then draining them and drying them in the sun to dry. The perilla seeds are then grinded using a disk mill with a screen measuring 3 mm, and perilla seed flour is produced, which will be used as a feed supplement for the ducks. The perilla seed flour was then analyzed proximate to determine its nutrient content.

**Animals and Diets**

The ducks used in the study were Day Old Ducks for five replications and six treatments each, so the total number of local male ducks used was 90, with an average initial body weight of 35, 36 grams. The 15 individual metabolic cages of 120 × 50 × 60 cm were used.

The study was conducted for nine weeks consisting of an adaptation period using basal feed (control) when the ducks were two weeks old and the treatment period and performance observations on ducks aged 3 to 8 weeks. Data collection for consumption and digestibility of feed was collected when ducks were 8 to 9 weeks old.

The treatments applied were: P0: 100% basal ration without seed supplementation of *Perilla frutescens* L.; P1: 97.5% basal ration + 2.5% seed supplementation of *Perilla frutescens* L.; P2: 95% basal ration + 5% supplement of *Perilla frutescens* L. seeds.

**Research methods**

The feed ingredients for basal feed consist of yellow corn, pollard, rice bran, soybean meal, mixed vitamins, and feed supplements in the form of perilla seeds (*Perilla frutescens*). The ration composition and content of the treatment rations in the study are presented in Table 1. according to the Standar Nasional Indonesia (2006) for local duck feed.

**Table 1.** Formulation and nutrient content of treatment rations

Composition of feed ingredients	Treatment (on a DM basis)		
	P0 (%)	P1(%)	P2(%)
Yellow corn	46.50	45.37	44.29
Soybean meal	21.50	20.85	20.12
Rice bran	20.00	19.51	19.05
Pollard	9.50	9.27	9.05
Perilla seed meal	0.00	2.50	5.00
Mineral-vitamin mix <sup>*)</sup>	2.50	2.50	2.50
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>
<b>Nutrient Composition</b>			
Metabolizable Energy (kcal/kg)	2908.09	2994.53	3080.97
Crude protein (%)	18.52	19.15	19.77
Crude fiber (%)	4.29	5.04	5.79
Crude fat (%)	3.13	4.21	5.29
Calsium (%)	0.90	0.91	0.91
Phosphor (available) (%)	0.72	0.72	0.73

<sup>\*)</sup> in 10 kg contained: Vitamin A 12,000,000 IU, Vitamin D3 2,000,000 IU, Vitamin E 8,000 IU, Vitamin K 2,000 mg, Vitamin B1 2,000 mg, Vitamin B2 5,000 mg, Vitamin B6 500 mg, Vitamin B12 12,000 g, Vitamin C 25,000 mg, Calcium-D-pantothenate 6,000 mg, Niacin 40,000 mg, Choline chloride 10,000 mg, Methionine 30,000 mg, Lysine 30,000 mg, Manganese 120,000 mg, Iron 20,000 mg, Iodine 200 mg, Zinc 100,000 mg, Cobalt 200 mg, Copper 4,000 mg, Zinc Bacitracin 21,000 mg, Excipient q.s 10,000 mg.

**Digestibility of nutrient value**

The data collection stage was carried out by in vivo digestibility testing using the procedure from (El-Husseiny *et al.*, 2007).

**Measurement of feed consumption and feed digestibility Feed consumption.**

Feed consumption is measured by the amount of ration given minus the amount of remaining feed expressed in g / head/day.

**Nutrient digestibility.** Crude protein digestibility is calculated using the formula (Tillman *et al.*, 1998) as follows:

$$\text{Crude protein digestibility (\%)} = \frac{\text{protein consumed (g)} - \text{Excreta protein (g)}}{\text{Protein consumed (g)}} \times 100\%$$

Noted :

Excreta protein = 70 % x excreta protein because uric acid levels in the excreta assumed to be urine is 30% excreta (Wahju, 2004).

$$\text{Crude fiber digestibility (\%)} = \frac{\text{fiber consumed (g)} - \text{Excreta fiber (g)}}{\text{Fiber consumed (g)}} \times 100\%$$

$$\text{Crude fat digestibility (\%)} = \frac{\text{fat consumed (g)} - \text{Excreta fat (g)}}{\text{Fat consumed (g)}} \times 100\%$$

$$\text{Organic matter (OM) digestibility (\%)} = \frac{\text{OM consumed (g)} - \text{OM protein (g)}}{\text{OM consumed (g)}} \times 100\%$$

**Data Analysis**

This research was conducted experimentally using a Completely Randomized Design (CRD) if there was an effect between treatments, it was continued with the Duncan Multiple Range Test (DMRT). Data analysis using the IBM SPSS Statistic 22 program

**Feed consumption**

The result of feed consumption for treatments P0, P1, and P2 were 101.36 ± 8.62; 102.84±15.90; and 102.39 ± 16.25 g/head/day. The results of the analysis of variance showed that the mean ratio consumption between treatments was not significantly different (Table 2). This is because the nutrient content of the rations has the same protein and energy. Feed consumption in livestock can be influenced by its protein and energy content. Ration consumption will increase when given rations with low energy content, and vice versa will decrease when given rations with high energy content. This is because poultry consumes rations primarily to meet their energy needs (Anggorodi, 1995). Protein consumption is influenced by the feed's metabolic energy and protein content (Tillman et al., 1998).

**RESULT AND DISCUSSION**

Based on the results of data analysis on three treatments showed a very significant effect on the effect of perilla seed supplementation on the variables of feed consumption, crude protein (CP) digestibility, crude fat (CFat) digestibility, crude fiber (CFib) digestibility, and organic matter (OM) digestibility. The research results regarding the consumption and digestibility of perilla seed supplementation are presented in Table 2.

**Table 2.** Digestibility of nutrients supplemented with perilla seeds on duck rations.

Variable	P0	P1	P2	P Value
Feed consumption (g)	101,36±8,62	102,84±15,90	102,39±16,25	0,984
CP digestibility (%)	77,05±1,48 <sup>a</sup>	75,26±1,15 <sup>b</sup>	71,96±0,10 <sup>c</sup>	0,000
CFat digestibility (%)	76,03±1,56 <sup>a</sup>	82,72±0,80 <sup>b</sup>	84,08±0,58 <sup>b</sup>	0,000
CFib digestibility (%)	38,21±3,98 <sup>a</sup>	49,87±2,33 <sup>b</sup>	56,73±1,54 <sup>c</sup>	0,000
OM digestibility (%)	55,45±2,90	54,83±2,10	56,32±1,60	0,590

Notes: <sup>a, b, c</sup> different superscripts show a significant difference between treatments

**Digestibility of Crude Protein**

Based on the results of the analysis of protein digestibility data in local ducks,

showed a very significant difference (P<0.05) between crosses. The effects of the average protein digestibility with perilla

seed supplementation in local ducks based on research ranged from 71.96% -77.05%; this result was relatively high. According to Maghfiroh *et al.* (2012) that the level of protein digestibility is said to be high if it is >70%, the medium is 50-70%, and low when it is 50-60%. This is supported by the opinion of Leke *et al.* (2012) protein digestibility in ducks ranged from 75 – 90%.

Table. 2 showed a highly significant difference between treatments ( $P<0.05$ ). Increasing perilla seed supplementation in rations has the effect of reducing protein digestibility in local ducks. The digestibility value of feed protein is influenced by several factors, one of which is anti-nutrition. Tannins are one of the anti-nutrients that can reduce the digestibility value of feed. The content of perilla seeds contains a tannin compound of 0.672% so it can affect the value of nutrient digestibility (Liu, 2008). Tannins can combine proteins, and polymers such as cellulose, hemicellulose, pectin, and minerals, thereby slowing down the digestion of these compounds (McSweeney *et al.*, 2001). In addition, the action of tannins which bind to protein and carbohydrate components also affects digestibility. Condensed tannins are more challenging to hydrolyze, so the binding of feed protein by condensed tannins is stronger (Jayanegara dan Palupi, 2010). The increase in the addition of perilla seeds in the ration has an impact on the high tannin content in the ration. In this case, it will affect the digestibility of protein so that the more perilla seed supplementation given, the lower the protein digestibility.

#### **Digestibility of Crude Fat**

The results of the data analysis showed that the digestibility of crude fat was highly significant ( $P<0.05$ ) to the treatment given perilla seed supplementation. Supplementation of perilla seeds increased the digestibility of crude fat, but there was no significant difference in treatments 1 and 2. The digestibility value of local duck crude fat in each treatment was in the normal range, namely 76.03% - 84.08%. A study conducted by Widiyastuti (2007) stated that giving shrimp head flour treatment in duck

rations resulted in crude fat digestibility values ranging from 71% - 86.7%.

The increase in the digestibility of crude fat supplemented by perilla seeds can be due to the high content of unsaturated fatty acids and the high crude fat content of perilla seeds. According to (Hadi dan Sudiyono, 2019), the crude fat content of perilla seeds is 43.01%. Perilla seeds have a high content of  $\alpha$ -linoleate (Longvah & Deosthale, 1991). (Prawitasari *et al.*, 2012) states that omega-6 fatty acids serve as precursors for the formation of prostaglandins which play a role in stimulating small intestine motility and play a role in the absorption of nutrients for livestock so that they can affect the value of nutrient digestibility.

#### **Digestibility of Crude Fiber**

The average crude fiber digestibility results in table 2 are in the range of 38.21% -56.73%. Adding perilla seed supplementation to the ration can increase the digestibility of crude fiber in local ducks. Based on the diversity analysis in table 5, treatments P1, P2 and P3 showed very significant differences ( $P<0.05$ ). Adding perilla seed supplementation in the ration increases the digestibility of crude fiber. Several factors, including feed consumption, the fiber content in the feed, the composition of the crude fiber constituents, and the activity of microorganisms, influence crude fiber digestibility. This is supported by the opinion of Lesson and Summers (1997), ducks are able to digest crude fiber higher than broiler chickens. The digestibility value of crude fiber in ducks can be affected by the consumption of crude fiber in the ration. The too-high crude fiber content in the ration can interfere with the digestion of other nutrients in the ration. The digestibility value of crude fiber can be influenced by several factors, including the crude fiber content in the feed, the composition of the crude fiber, and the activity of microorganisms (Maynard *et al.*, 2005). Providing rations with high levels of crude fiber causes the utilization of ration nutrients to be low and causes a decrease in body weight (Hsu *et al.*, 2000). Adding

perilla seed supplementation increased the crude fiber content in the ration. This affects the consumption of crude fiber in the ration so that it can increase the digestibility of crude fiber consumed by ducks.

#### **Digestibility of Organic Matter**

The digestibility of organic matter in a feed shows the quality of the feed digested by the body. Based on the diversity analysis, the use of perilla seed supplementation in the duck rations was not significantly different ( $P>0.05$ ) in the digestibility of organic matter. The data analysis showed that the average digestibility of organic matter supplemented with perilla seeds in the ratio ranged from 54.83% to 56.32%. Research results (Rompas et al., 2016) on the digestibility of organic matter ranged from 74.13% -76.27%.

The digestibility of organic matter in rations is influenced by several factors, one of which is dry matter consumption. Sutardi (1980) stated that organic matter is closely related to dry matter because organic matter is part of the dry matter. According to Tillman et al. (1998), several factors can affect the digestibility value of the organic matter, namely the nutrients contained in the ration. The high content of crude fiber in the feed that cannot be digested in the digestive tract can cause other nutrients that can be digested to be not completely digested and can come out with the excreta, thereby reducing the digestibility of other nutrients in the feed.

#### **CONCLUSIONS**

The addition of perilla seed supplementation up to a level of 5% in duck rations can increase the digestibility of crude fat and crude fiber digestibility, but reduce the digestibility of crude protein because there are anti-nutritional compounds that can bind protein in perilla seeds but have no effect on feed consumption and digestibility of organic matter on ducks.

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