Proximate Quality of Laying Hens Feed with the Addition of Sardine Waste

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Abstract. This study aims to determine the effect of increasing the value of carbohydrate, protein, fat, and calories content in artificial feed added with fish oil and to find out the best composition of the addition of fish oil in artificial feed that provides optimal protein levels for the growth of laying hens. This study used materials was rations of feed production from PT. Charoen Pokphand Indonesia, Tbk 35%, Bran 15% kg and Corn 50% kg. Then an experiment was carried out with 3 treatment samples and 1 control sample. The fish oil used comes from sardine waste produced by the Department of Animal Husbandry, Jember State Polytechnic. Then the samples were tested for their proximate quality at the Saraswanti Indo Genetech Laboratory in Surabaya. The parameters we used for determining the proximate quality are ash content, calorie from fat, total fat, moisture content, total calories, carbohydrate, and protein content. From the result we concluded that the samples treated with the addition of 5% fish oil produced the best quality in terms of protein and fat content which met the needs of laying hens. The results of this study can be used as a basis and reference for the development of functional egg production.

Keywords: Feed · Laying · Proximate · Sardine · Waste

1 Introduction

Protein feed for laying hens has so far fluctuated and still has to be imported from abroad causing difficulties for breeders [1, 2]. So, it is necessary to look for other sources of protein that are cheaper and easier to obtain [3]. This study aims to determine the effect of increasing the value of carbohydrate, protein, fat, and calories content in artificial

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feed added with fish oil and to find out the best composition of the addition of fish oil in artificial feed that provides optimal protein levels for the growth of laying hens.

Several facts show that omega-3 and omega-6 fatty acids from the food consumed by humans play an important role in the function and integrity of the brain, and are important factors in the formation and growth of the brain [4–6]. Besides that, it also functions in terms of preventing cardiovascular disease (atherosclerosis and coronary heart disease), cancer, tumors and affecting the immune system [7–9]. Many attempts have been made to enrich the content of omega-3 and omega-6 fatty acids in various foods [10–12]. In the livestock sector, it is also a challenge to make livestock products rich in omega-3 and omega-6 fatty acids, one of which is free-range chicken eggs [13, 14].

Engineering aspects of feed is an effort that can be done to produce products that are rich in fatty acids omega-3 and omega-6 [15, 16]. The results showed that the addition or supplementation of omega-3 and omega-6 fatty acids in the diet will be stored in various body tissues [17, 18]. A feed source rich in omega-3 fatty acids can be obtained from marine fish oil [19, 20]. Feed ingredients that are rich in omega-6 fatty acids generally contain a lot of oils derived from plants, including corn oil [21]. Some research results recommend that the balance of omega-3 and omega-6 for human consumption is 1:4 to 1:10 [10, 22]. Increasing the content of omega-3 and omega-6 fatty acids in eggs with the recommended ratio can be attempted by adding a combination of corn oil and fish oil in chicken rations [23]. One of the sardine wastes is in the form of Lemuru fish oil which can still be used as feed to produce high omega eggs and protein. The fish oil from sardine waste which is rich in PUFA in can add in the chicken rations.

The main nutrients of laying hen rations were energy metabolism, protein (amino acids), fat (essential fatty acids), minerals and vitamins. Feed quality greatly influenced the quality and quantity of eggs produced [30, 31]. The waste of canned tuna in the form of oil can be used as a source of energy and essential fatty acids which are cheap and easy to obtain. Tuna fish oil is produced from pressed tuna and has an energy content of 8260 kcal/kg, mainly omega-3 fatty acids EPA (Eicosapentaenoic) 33.6–44.85% and DHA (Docosahexaenoic) 14.64% and fat contains 5.8% [32]. Rations that contain high fat will increase the retention time of feed in the small intestine or extend the flow rate so that the process of digestion and absorption will be better. The use of Tuna fish oil in rations is one of the efforts made to increase the productivity of laying hens, especially to produce eggs that have high nutritional content. The addition of Tuna fish oil in the ration is expected to improve performance seen from the many benefits of fish oil as animal feed. The layer chicken feed must contain sufficient energy to help metabolic reactions, support growth and maintain body temperature, besides that chickens need balanced protein, phosphorus, calcium and minerals and vitamins which have an important role during the early stages of their lives [33]. The nutritional content of Lemuru fish oil in rations for laying hens consisting of a mixture of commercial feed and local ingredients has never been found, so it is necessary to test the quality of the feed made to ensure the balance of nutrients produced. One of them is by testing the proximate quality of the feed. Thus, this study aims to determine the proximate quality of laying hen rations with the addition of Lemuru Fish Oil Of sardine waste as a basic ingredient in producing high-quality eggs.

Table 1. Parameter Measurement Method

No.	Parameter	Unit	Method
1	Ash content	%	SNI 01-2891-1992 point 6.1
2	Calorie from fat	Kcal/100 g	Calculation
3	Total fat	%	18-8-5/MU/SMM-SIG point 3.2.1 (Sokhlet)
4	Moisture content of Rations Feed	%	SNI 01-2891-1992, point 5.1
5	Moisture content of Fish Oil	%	18-11-44/MU/SMM-SIG (Karl Fischer)
6	Total calories	Kcal/100 g	Calculation
7	Carbohydrate	%	18-8-9/MU/SMM-SIG (calculation)
8	Protein content	%	18-8-31/MU/SMM-SIG (Titrimetri)

2 Material and Methods

This research materials were rations feed that consist of the from feed production from PT. Charoen Pokphand Indonesia, Tbk 30 kg (35%), Bran 22 kg (15%) and Corn 48 kg (50%) and adding the fish oil of sardine waste. Then an experiment was carried out with 3 treatment samples and 1 control sample (P_0 = Control (without adding fish oil, P_1 = adding Fish oil 5% in rations feed, P_2 = adding fish oil 10% in rations feed, and P_3 = adding fish oil 15% in rations feed). The fish oil used comes from sardine waste produced by the Department of Animal Husbandry, Jember State Polytechnic. The oil fish and samples were tested for their proximate quality at the Saraswanti Indo Genetech (SIG) Laboratory in Surabaya. The process in this research could be seen in Fig. 1 and the rations feed every treatment in Fig. 2. The parameters we used for determine the proximate quality are ash content, calorie from fat, total fat, moisture content, total calories, carbohydrate, and protein content. The measurement method used to determine the parameter value showed in Table 1.

3 Result and Discussion

The nutritional content of the oil fish can be seen in Table 2 and the effect of giving and adding fish oil to proximate quality of the laying hens feed could be seen in Table 3.

Based on the results of tests conducted in the laboratory, it showed that the ash content at P0 = 10.63%, P1 = 10.26%, P2 = 12.05%, and P3 = 10.80%. So, the ash content added to fish oil tends to be the same. The ash content an ration was too much in a poultry diet might cause crystals that were being formed within the urinary-tracts, excluding the kidneys, and the bladder, specifically in poultry faunas that ensure kidney diseases, also excess ash content caused the bones and joint problems in growing poultry birds [24]. Nevertheless, the feeds with stumpy ash-content were cooperative in monitoring the urinary-tract complications, the literature had not recorded that feeds

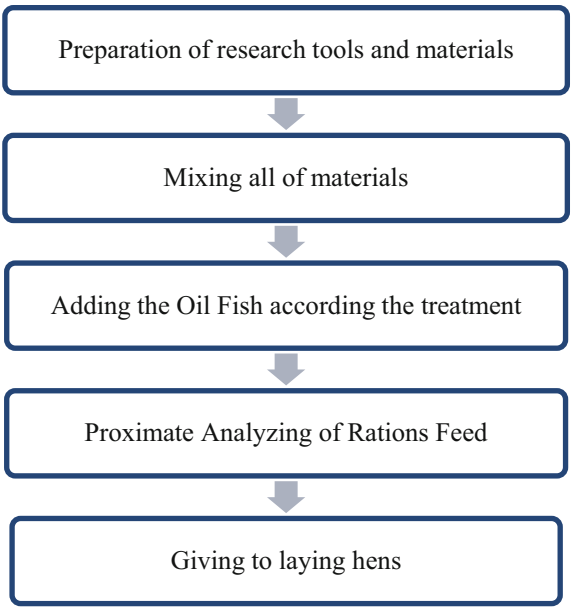

Fig. 1. Flowchart of Research Process

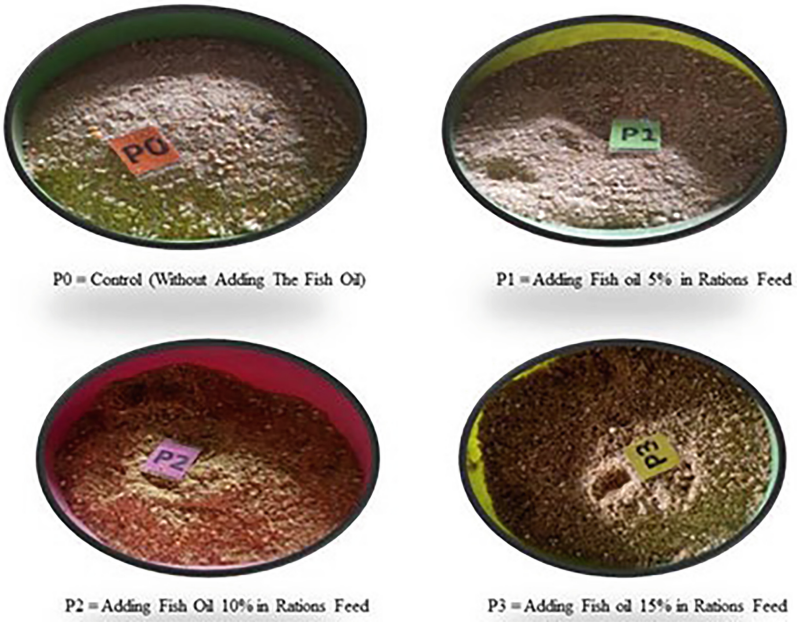

Fig. 2. Feed Rations Each Treatment

Table 2. Proximate Quality Result of Sardine Waste Fish Oil

No.	Parameter	Unit	Value
1	Ash content	%	<0.02
2	Calorie from fat	Kcal/100 g	899.10
3	Total fat	%	99.10
4	Moisture content	%	0.10
5	Total calories	Kcal/100 g	899.10
6	Carbohydrate	%	0
7	Protein content	%	<0.04

Table 3. Proximate Quality Result of Rations Feed

No.	Parameter	Unit	P0	P1	P2	P3
1	Ash content	%	10.63	10.26	12.05	10.80
2	Calorie from fat	Kcal/100 g	53.19	77.13	129.78	157.95
3	Total fat	%	5.91	8.57	14.42	17.55
4	Moisture content	%	9.96	9.81	8.96	8.73
5	Total calories	Kcal/100 g	347.19	362.57	188.06	409.63
6	Carbohydrate	%	58.61	56.10	50.44	49.92
7	Protein content	%	14.89	15.26	14.13	13.00

that were high in ash-content were beneficial to poultry birds that were being raised for meat and eggs [25]. Therefore, all three samples were good choices for poultry-mix formulation considering their ash content but different mineral composition. Calories from fat for P0 = 53.19 kcal/100 g, P1 = 77.13 kcal/100g, P2 = 129.78% and P3 = 157.95 kcal/100 g. Based on the results shown, the fat calories in the samples given the addition of fish oil were higher. The higher the concentration of fish oil, the higher the calories from fat were same conclusion for total calories. Thus, total calories from high fat would be directly proportional to total calories.

Total fat for observation P0 = 5.91%, P1 = 8.57%, P2 = 14.42%, and P3 = 17.55% It could be concluded that the total fat would be higher if the concentration of fish oil was also higher. Poultry rations feed with the high of unrefined lipid content would be ideal for poultry birds raised for meat; hence Benny seed and red bean-maize bran would be a good choice for such poultry farmer [25]. In poultry farms, fat was not a superior demand, soya bean bread bran would be appropriate as it would provide the required energy needed by the chicken [26]. Fat accounts for about 3–5% of most practical diets [27]. Other benefits of fats include better dust control in feed mills and poultry houses, and improved palatability of diets. Poultry have a specific requirement fat in form of linoleic acid had been demonstrated. The linoleic acid was the only essential fatty acid

needed by poultry, and its deficiency had rarely been observed in birds fed practical diets. Linoleic acid was main effect in laying hens that on egg size.

The water content in the control observation (P0 = 9.96%), while the sample added 5% fish oil (P1 = 9.81%), 10% fish oil (P2 = 8.96), and 15% fish oil (P3 = 8.73%). Thus, the higher the concentration of fish oil added, the lower the water content (decreased value). Moisture content could effect on the chemical and physical quality of the feed, which relates to its freshness and stability for the storage of the feed over a long period of time [28]. Before, it was advisable to formulate feed with low moisture content for feeding poultry to keep deterioration in the feed to a minimum during storage. Carbohydrate value at P0 = 58.61%, P1 = 56.10%, P2 = 50.44%, P3 = 49.92%. The level of carbohydrate should be low in the feed, which would not be beneficial for broilers and layers in terms of health issues.

Finally, the protein values in all treatment samples, the protein content tended to be the same, namely P0 = 14.89%, P1 = 15.26%, P2 = 14.13%, P3 = 13.00%. The function of dietary protein was supply amino acids for maintenance, muscle growth and synthesis of egg protein [29]. The synthesis of muscle and egg proteins requires a supply of 20 amino acids, all of which were requirements of physiological. Ten of 20 amino acids were either not synthesized at all or were synthesized too slowly to meet the metabolic requirements and were designated as essential elements of the diet. These need to be supplied in the diet. The balance could be synthesized from other amino acids; these were referred to as dietary non-essential elements and need not be considered in feed formulations. Poultry did not have a requirement for protein. However, an adequate dietary supply of nitrogen from protein was essential to synthesize non-essential amino acids. This ensures that the essential amino acids were not used to supply the nitrogen for the synthesis of non-essential amino acids. Satisfying the recommended requirements for both protein and essential amino acids therefore ensured the provision of all amino acids to meet the birds' physiological needs.

4 Conclusions

The study can be concluded that the samples treated with the addition of 5% fish oil produced the best quality in terms of protein and fat content which met the needs of laying hens. The result of this study is preliminary research that can be used as a basis and reference for the development of functional egg production.

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