The effect of giving chitosan to Accessories Organ and Reproductive Organ of Tegal Duck

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Abstract. The aim of the study was to determine the effect of adding several levels of chitosan in the ration to the weight of the accessories organ and reproductive organs of Tegal duck. The study used a completely randomized design (CRD) with 4 treatments and 5 replications. The treatment is R0 = 0% chitosan, R1 = 0.5% chitosan, R2 = 1% chitosan and R3 = 1.5% chitosan. The variables measured are the weight percentages of the acesories (liver and pancreas) and the weight of the reproductive organs (ovaries and oviducts). Data was processed using SAS Windows 16. The results showed that chitosan administration gave an average percentage of weight of liver, ovary and oviduct not significantly different between treatments (P> 0.05). The administration of 0.5% chitosan in the R1 treatment ration showed that the pancreatic weight was 18.2% lower than the control.

Keyword: Chitosan, Accessories Organ, Reproductive Organ of Tegal Duck

1. Introduction

The productivity of poultry is greatly influenced by the smooth performance of the organs. Feed given to livestock affects the quality of body organs in carrying out its functions. A healthy livestock body has healthy organs so that it can carry out optimal bodily functions. The organ that can regulate the body's metabolism and has the bile glands to produce bile salts is the liver. Bile salts are needed in fat digestion. Meanwhile, the pancreas, which is in the duodenum of the small intestine in the digestive tract, acts as a producer of digestive enzymes to aid in the digestion of major nutrients in rations such as carbohydrates, proteins, and fats. These two accessory organs (liver and pancreas) help each other smooth the body's metabolism. Likewise with the function of other body organs such as ovaries and oviducts. Both of these organs are primary reproductive organs in producing eggs. The growth and development of these organs determine the quality and quantity of eggs produced by poultry.

Tegal duck is classified as waterfowl and is a type of laying poultry. The ability to spawn an animal is influenced by the ration consumed. Cells and tissues grow and develop healthily and carry out their roles optimally if the ration has sufficient nutrition. Daily egg production from ducks will increase if organs such as the digestive system and reproductive system are running optimally. Tegal duck has 60-70% of eggs at peak production. This is greatly supported by the quality of the ration given, especially the protein content. In addition, the ration needs to

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have a functional value in the form of a mixture of other ingredients which are intentionally added to increase the productivity and performance of ducks.

Chitosan has properties as an antioxidant, antibacterial, binder fat and cholesterol. Chitosan products come from the isolation of crustacean waste and are often referred to as animal fibers. The small intestine cannot absorb this non-toxic chitosan. The digestive system will run smoothly with the presence of this chitosan in the ration. In the digestive tract, the microflora balance is triggered by the nature of chitosan itself which cannot be absorbed by the body and is fibrous. Fibrous food is the main life support for the bacteria so that the condition of the digestive tract becomes healthy and conducive. If so chitosan will contribute to making the body's organs healthy so that it functions optimally. This study aims to see the effect of giving chitosan on the morphological development of accessory organs and the reproduction of laying ducks.

2. Materials And Methods

2.1 Materials

2.1.1 Ration

The experimental ration used was arranged with 15.34% Protein content and 2809 kcal /kg Metabolic Energy [1] for the layer period according to the needs of the ducks used in this study. The raw materials used for basal rations are corn, bran, soybean meal, coconut cake, fish meal, bone meal, shell flour and premix. Chitosan used was pure chitosan from the IPB Fisheries Processing Technology Laboratory.

2.1.2 Duck

The ducks used were currently in production, as many as 40 heads. Ducklings were placed in pens that have been equipped with lighting, and a place to eat and drink. In the final stage, for each treatment, 5 ducks were slaughtered to collect internal organ weight data in the form of appendages (liver and pancreas) and reproductive organs (ovaries and oviducts). The ducks were kept for 7 weeks.

2.2 Research Methode

Completely randomized design (CRD) was used in this study with 4 treatments and 5 replications, consisting of 2 ducks per replication. The treatment ration was made by adding chitosan (according to treatment dosage) into the basal ration. The dose of chitosan used comes from in vitro research (Sahara et al., 2017) about finding the best dose of chitosan in inhibiting the growth of Salmonella sp. This dose was applied in vivo to ducks by adding to the ration. The treatments were: R0 = 0% chitosan R1 = 0.5% chitosan R2 = 1.0% chitosan and R3 = 1.5% chitosan. The parameters measured were the percentage of the weight of the accessory organs (liver and pancreas) and the percentage of the weight of the reproductive organs (ovary and oviduct. Each liver and pancreas weight divided by life weight and multiplied by 100% is used to calculate the percentage of accessory organ weight, while each ovary and oviduct weight divided by life weight and multiplied by 100% is to calculate the percentage of reproductive organ weight. The data is then analyzed with variance using SAS Windows 16.If it shows a real effect then proceed with Duncan's distance test to see the differences between treatments.

3. Results and discussion

3.1 Results

3.1.1 Effect of Chitosan Administration on Percentage of Weight of Accessory Organs

Data on the percentage of liver and pancreatic weights are presented in Table 1. The mean percentage of liver weights for all treatments are the same (P> 0.05), whereas the real pancreatic weight (P <0.05) is influenced by the presence of chitosan in the ration.

Table 1. The average weight percentage of accessory organs (liver and pancreas) of Tegal ducks

Parameters (accessory organs)	Treatments (Chitosan)			
	R0%	R0,5%	R1%	R1,5%
liver	4,35	3,75	3,83	3,87
pancreas	0,37 b	0,30 a	0,36ab	0,31ab

Information ; Different letters on the same line show significant differences (P <0.05)

The percentage of liver weight in this study ranged from 3.75% - 4.35% of the body weight. This means that the average liver weight in this study was 4.05%. This heart weight is greater than Putnam's statement [2], which is 1.70 - 2.80%. The percentage of liver weight in Sumiati [3] study was 2.1% - 3.32% in male local ducks aged 8 weeks. The results of this study indicate that the age and strain of livestock greatly affect liver weight. Nickel et al., [4] in Retnani et al., [5] liver weight of body weight ranges from 1.7-2.3%. The liver weight in this study was almost the same as Bakrie et al., [6] in Bestari., [7] that the liver weight was 3.88%. This proves that the age and strain of the poultry used can cause differences in the percentage of liver weight. The liver is one of the complement organs of the digestive system in addition to the pancreas and gallbladder [8]. The liver acts as a detoxification tool and regulates the body's metabolism for poultry. In accordance with its role, the liver will offer and neutralize toxins, regulate the circulation of hormones, and regulate fat, sugar, protein, and other substances found in the blood. Bile is also produced by the liver for fat digestion. Liver weight was obtained in balance in this study presumably due to not increasing the workload of the liver with the addition of chitosan in the ration. The weight of the liver will decrease with age.

The role of the pancreas is very important in helping the smooth functioning of the digestive system. One function of the pancreas is to produce digestive enzymes such as lipolytic, amylolytic and proteolytic [9]. The average pancreatic weight in this study is 0.30 - 0.37%. The administration of 0.5% chitosan in the ration (treatment R1) significantly (P <0.05) had a pancreatic weight 18.92% lower than the control. While other treatments show an average of the same pancreatic weight. The cause is presumably because the treatment of R1 (0.5% chitosan) markedly reduced egg cholesterol highest compared to other treatments. Cholesterol levels in R1 treatment were 31.93% lower than controls. This makes the fat and cholesterol in the digestive tract more effectively bound by chitosan and thrown into the feces. This factor is thought to cause the role of lipase enzyme produced by the pancreas in digesting fat so it decreases. This causes a reduction in stimulation of the work of the pancreas in producing the lipase enzyme. Digestion of carbohydrates, proteins, and fats is assisted by the enzymes trypsin, lipase, and amylase secreted by the pancreas (Blackly and Bade, 1991).

3.1.2 The Effect of Chitosan on Percentage of Reproductive Organ Weight

Ovaries and oviducts are the primary reproductive organs in female poultry. The average percentage of each reproductive organ of Tegal ducks in this study is balanced, namely ovaries 0.85 - 2.32 or an average of 1.59 and oviducts 1.81 - 3.36 or have an average of 2.59.

Table 2. Average percentage weight of reproductive organs (ovaries and oviducts) Tegal ducks

Parameters (reproductive organs)	Treatments (Chitosan)			
	R0%	R0,5%	R1%	R1,5%
Ovaries	2,29	2,32	0,85	1,43
oviducts	3,28	3,36	1,81	2,48

In the process of egg formation, liver function is crucial in synthesizing protein. Protein is the main nutrient in egg formation besides fat. Therefore, amino acids absorbed from the feed will be circulated to the liver. Ganong, (2009) states that the liver acts as a metabolic center, the role of changing amino acids into proteins which are then transported to the ovaries in the process of egg formation. In addition, the liver also regulates fat, sugar, protein, and other substances found in the blood for the formation of egg cells. According to Obaidi et al (2011) that egg yolks are composed by 16.59% protein and 33.72% fat. Ovaries contain stratified egg yolk follicles ranging from small to large sizes. Cooked follicles will be ovulated into the oviduct. So it is suspected that ovary weight is strongly influenced by the number of egg yolk follicles as ovary material. The average percentage of ovarian weight in this study was the same for all treatments, namely an average of 1.59. This means that giving chitosan is not a role to increase production so it does not affect the development of the ovaries and oviducts but is to maintain the health of the digestive tract. This is supported by research Sahara et al., (2016) in a previous study of the use of adding chitosan to the ration did not affect the daily egg production for Tegal ducks at the 7-week maintenance period. Ducks that are actively laying eggs have a reproductive tract that develops just like the oviduct as a channel for egg formation. Sturkie (1976) states that when ducks are actively laying eggs, ovaries will produce more estrogen hormones to maintain oviduct activity. The average percentage of oviduct weight in this study is the same for all treatments, that is 2.59. The ducks used in this study are those that are actively producing with iso protein and energy rations. This means that the secretion of the hormone estrogen which plays a role in maintaining the development of oviduct is also the same. This is thought to be one of the causes of the development of the oviduct's weight being the same. Chitosan used in this study was more instrumental in maintaining the health of the digestive tract of livestock.

4. Conclusions

The ration added with chitosan did not affect the percentage of liver weight and reproductive organs of adult female Tegal ducks. Giving chitosan 0.5% in the ration (treatment R1) obviously has a lower percentage of pancreatic weight 18.92% of the control.

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