

## EFFORTS TO IMPROVE QUALITY OF DUCK EGG YOLK THROUGH GIVING RATIONS CONTAINING SPIRULINA

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### Abstract

Generally raising duck in Indonesia aims to produce eggs, thus the quality of eggs becomes important and determine the success marketing of business results. After increasing the production of eggs, people also tend to choose duck eggs that have a good quality. The Aspects that are usually to be the consumer consideration in choosing the good quality of duck eggs are the color of yolks are not pale, eggs have a large size and cleanliness of eggshell. It is well known that the diet has affects to the color of yolks, ie feed ingredients containing carotenoid pigments especially beta carotene and xanthophyll pigments. The Feed that contain a lots of beta carotene and xantophil pigments is in forage likes Spirulina (Spirulina Sp.). Spirulina (Spirulina Sp.) is a single cell protein (PST) microalga that can be a source of dye laying duck ration because of very high contains in fikocyanin, xanthophyll and beta-carotene. The study used a Completely Randomized Design with 5 doses treatment of addition of spirulina (0, 0.5, 1, 1.5, and 2%of the ration). Replication is done 4 times, so there are 20 unit of experiments and required 80 laying ducks. The observed variables include egg weight, yolk index, yolk percentage and yolk score. The results showed that egg weight, yolk index and yolk percentage were not significant. The addition of spirulina, one percent in ration (R2) can produce the standard quality of yolk which is in great demand by consumers with yolk score of 9.35.

**Key words :** quality of yolk, ducks, spirulina

### INTRODUCTION

Duck business can contribute in meeting the needs of animal protein consumption for the community both in quantity and quality. Currently the healthy lifestyle of society is better, so they more selective in consuming duck eggs. Besides the eggs cleanliness, consumers interested to large eggs size and bright yellow of yolk duck eggs relatively. The quality of duck eggs is an important criterion for consumers and producers of duck eggs. To produce the good yolk color of ducks eggs is not easy to do for producers, considering the duck rearing system is currently done intensively. The yolk color is strongly influenced by the content of xanthophyll and beta-carotene in the ration. The content is a coloring agent that required laying poultry for pigmentation at the time of

egg yolk formation (vitellogenesis). In an extensive or semi intensive rearing system, ducks obtain the coloring agent from the forage that is consumed. While intensive duck maintenance does not get forage, unless the breeder gives special forages. While lately forage more difficult to obtain because of the narrower of agricultural land and changes land functions. Therefore, the case of pale yolk eggs become a problem for laying poultry breeders, especially duck breeders. The solution of the problem can be done by providing a source of pigment in the duck ration. Spirulina (Spirulina Sp.) Is a microalga single cell protein (PST) source that can be a source of dye in laying duck ration because it contains high dye of fikocyanin, xanthophyll and beta-carotene. Another advantage of spirulina, it is easily cultured, requires no large area, relatively faster regeneration time, can be cultured on medium containing nitrogen, phosphorus and organic potassium. So with these advantages can answer the problem of farmers'

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difficulties in obtaining forage source of dye xanthophyll and carotene. Based on this, it is important to do research about 'Efforts to Improve the Quality of Duck Eggs through the given ration Containing of Spirulina so that spirulina can be a colour giver of feed supplement in duck rations

## MATERIAL AND METHODS

### Provision of spirulina

The provision of spirulina is done independently through cell culture process (multiplication) in open pond system culture at pilot scale. Culture pond has a length of 4 meters, width of 2 meters with a height of 0.5 meters. The pool culture capacity is 2000 liters and is able to meet the needs of spirulina for this study. The culture process begins by weighing the media materials according to the formulations by [1]. The culture pond filled with 2000 liters of clean water than the entire media is dissolved and stirred until homogeneous. After that the homogeneous media, followed by the addition of 200 liters of Spirulina fusiformis pure culture. Stirring is done during the culture process so that spirulina does not settle at the bottom of the pond. The culture pond is equipped with a stirrer in the form of a mill and uses the lamp as an artificial light source at night. This culture process take place for two weeks, so the spirulina biomass can be harvested on the 14th day. Biomass is harvested after the culture process is completed by filtration method using satin fabric, so that spirulina cells are separated from the culture medium. The obtained biomass is dried by oven at a maximum temperature of 300C. The dried biomass can be used for the purposes of this study. The harvested spirulina biomass is dried using a tumble dryer. Spirulina's dried biomass is readily available for research

### Preparation and Analysis of Rations

The ration is prepared according to the nutrient needs for laying ducks. The ration for laying ducks, contain 17% crude protein, 3.47% calcium, 1.1% Phosphorus and Metabolic Energy 2,650 kcal per kg [2]. Dietary content and Metabolizable Energy of

Basal ration (R0) in this study containing 17.54% Crude Protein, 7.82% Fats, Crude fiber 6.51%, Calcium 3.74%, Phosphorus 1.12 and Metabolizable Energy 2.644, 7 Kcal / kg (Results of analysis at Ruminant and Livestock Nutrition Laboratory of Animal Husbandry Faculty of Unpad)

### Cage Preparation and Livestock Experiments

This activity includes activities of cage preparation, feeder, drinker and other supporting equipment, sanitation activities and buying eighty ducks. Ducks are divided into twenty units of battery system cages.

### Rearing and Observation

The activity begins with weighing 80 ducks, then put the ducks randomly into 80 units of individual cage. Observation and data collection were done once a week. Observational data are processed and analyzed statistically

### Treatment

Treatment in this study is the provision of spirulina into the ration with the following doses:

- R0 = Basal ration ( $\neq$  contains spirulina)
- R1 = Basal ration + 0.5% spirulina
- R2 = Basal ration + 1% spirulina
- R3 = Basal ration + 1.5% spirulina
- R4 = Basal ration + 2% spirulina

### Observed Variables

- a. Egg weight (g)
- b. Egg Yolk Index (YI)
- c. Percentage of yolk (%)
- d. Egg yolk color score

### Experimental design

The research method used Completely Randomized Design (RAL), consisted of 5 treatments, with repetition 4 times every treatment, so that there were 20 unit experiments. In order to know the difference between treatment then the data obtained were analyzed using variance analysis (ANOVA). If the analysis results obtained at least one treatment that gives a real effect on the variables observed, then followed by Duncan test.

## RESULT AND DISCUSSION

### The Effect of Treatment on Egg Weight

The average weight of duck eggs from each treatment can be seen in Table 1.

Table 1 The Effect of Giving Rations That Contain Spirulina to Improve the Quality of Duck Eggs yolk

Parameter	R0	R1	R2	R3	R4
Egg weight (gram)	63.600	65.900	66.625	66.725	70.125
Egg Yolk Indeks	0.339	0.376	0.367	0.350	0.340
Percentage of Egg Yolk (%)	33.079	33.755	34.070	34.212	34.348
Egg Yolk colour Score	6.750 <sup>a</sup>	7.750 <sup>ab</sup>	9.350 <sup>bc</sup>	10.700 <sup>c</sup>	11.000 <sup>c</sup>

The highest mean egg weight was obtained from duck eggs which receive R4 (70.125 g), followed by treatment R3 (66.725g), R2 (66.625g), R1 (65.90g) and R0 (63.60g). Based on the results of statistical analysis, it was found that the treatment had no significant effect on egg weight. These results suggest that spirulina does not have a different effect on egg weight. This is caused by protein content of each treatment ration after spirulina added relatively balanced, so resulting a relatively the same egg weight. According [3]. that the mass of the egg is determined by genetic, protein in the ration, the stage of adulthood and age.

### Effect of Treatment on Egg Yolk Index

The mean of the highest egg yolk index was obtained from the treatment of R1 (0.376), followed by R2 (0.367), R3 (0.350), R4 (0.340) and R0 (0.339). Based on statistical analysis, it was found that the treatments had no significant effect on egg yolk index. This fact suggests that giving spirulina does not have a different effect on the egg yolk index. This is caused by the protein content of each treatment ration is relatively balanced and resulted relatively similar egg yolk index. Another factor causing the observed eggs has the same relative uniformity, since the yolk index measurement from each treatment is done in the same time that is on the first day of the spawn, so the eggs are still fresh. According to [4]. fresh eggs have a relatively small variation of the egg yolk index.

### Effect of Treatment on Percentage of Egg yolks

The percentage of duck egg yolk obtained from egg yolk is divided by the whole egg

weight multiplied by one hundred percent. The percentage of duck egg yolk from each treatment can be seen in Table 1. The highest percentage of egg yolk obtained from duck eggs received 2 percent spirulina addition (R4 = 34.348%), followed by 1.5 percent spirulina addition (R3 = 34.212%), 1 percent spirulina addition (R2 = 34.070%), 0.5 percent spirulina addition (R1 = 33.755%) and without spirulina addition (R0 = 33.079%). Based on the result of statistical analysis, it was found that the treatment had no significant effect ( $p < 0.05$ ) on egg yolk percentage. The addition of spirulina to the ration did not give a change to the duck eggs yolk percentage or can be said to be relatively the same resulted. That because of the egg yolk weight resulted of all treatments were relatively the same.

### Effect of Treatment on Egg Yolk Score

The average score of egg yolk from each treatment can be seen in Table 1. The highest score of egg yolk score obtained from duck eggs received 2 percent spirulina addition (R4) is 11,000 followed by treatment R3 (10.700), R2 (9.350), R1 (7.750) and R0 (6,750). Based on the results of statistical analysis, it was found that the treatment had significant effect ( $p < 0.05$ ) on egg yolk score. Then the differences between treatments were tested by Duncan's Multiple Test. Table 1 shows that egg yolk color score at R4 treatment was significantly higher ( $p < 0.05$ ) than in R0 and R1 treatments (without addition of spirulina and 0.5% spirulina addition), but not difference with R2 and R3 treatments. Furthermore, R2 treatment was significantly higher ( $p < 0.05$ ) than R0 treatment, but not difference with R1 treatment, that had significant higher to R0 treatment.

An increase in egg yolk color score as a result of spirulina containing a lot of carotene and xanthophyll. The increase in color score is due to the yolk color produced by oxycarotinoid or commonly known as xanthophyll pigments obtained by ducks from the rations they consume. Foods consumed by poultry, give a direct influence on the color of egg yolks, especially foods containing carotene pigment [5].[6] state that there is a linear relationship between egg yolk pigmentation with xanthophyll content in the ration

The Treatment of R2 (addition of 1% spirulina) can increase egg yolk score above standard (9,35). An increase in egg yolk color score in this result has met the standards of the most demanded by consumers is a minimum score of 9. Sources of carotene commonly found in the ration is sourced from yellow corn. The use of maize in ration formulation as much as 35 percent is not enough to get a good egg yolk score (at R0, the average score of egg color yolk only reached 6.75. Addition of 0.5 percent spirulina resulted in an increase in egg yolk score of 7.75 (still below standards). The increase of egg yolk color score that given by spirulina will be preferred by the consumer and will not affect the chemical composition of egg yolk. It is suspected that the higher of egg yolk score will result in the higher content of egg yolk A vitamin. This is in line with [7] opinion that bright egg yolks color contain more A vitamin than pale egg yolk color. According to [8] more A vitamin content in rations given to laying poultry, better A vitamin quality in the egg yolk

## CONCLUSION

The addition of spirulina in ration as much as one percent (R2) can produce the standard of egg yolk quality that many consumers demand. This is supported by the results of the research as follows:

1. The ducks treated with the addition of 1% spirulina (R2), resulted in a significantly higher egg yolk color score of 9.35 ( $p < 0.05$ ) than the R0 treatment (6.75) without the use of spirulina.
2. The addition of spirulina in all treatments had no effect to egg yolk

index (R0 (0.339), R1 (0.376), R2 (0.367), R3 (0.350) and R4 (0.40))

3. The addition of spirulina in all treatments had no effect to percentage of yolk (R0 (33.079%), R1 (33.755%), R2 (34.070%), R3 (34.212%), R4 (34.348%)).
4. The addition of spirulina in all treatments had no effect to egg weight ie R0 (63,60g), R1 (65,90g), R2 (66,625g), R3 (66,725g) and R4 (70,125g)

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