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Research Paper

The Effect of Fermented Palm Kernel Cake With *Bacillus subtilis*In Rations on Production Performance and Quail Egg Quality

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ABSTRACT: *This study aims to determine the effect of palm kernel cake fermented with Bacillus subtilis in rations on production performance and quail egg quality of quail layer. The material used in this study were two hundred quail layer 14 weeks of age (Coturnix coturnix japonica). Were randomly into five treatmens with four replication of 10 birds per replication. Treatment research was usage offermented palm kernel cake (FPKC) with 0 %, 10 %, 15 %, 20% and 25% FPKC.Research method was experimental using completely randomized design (CRD) with five treatments four replications. The research variables were feed intake, egg production, feed conversion, egg weight, thick eggshell and egg yolkof quail layers.The results of this research showed that feed intake, egg production, feed convertion, egg weight and thick eggshell of quail layers were not significant (P>0.05) affected. The conclusion that palm kernel cake fermented with Bacillus subtilis can be used up to 25% in the laying quail ration.*
KEYWORDS : *Quail, PKC, Ration, Egg Quality,Bacillus subtilis*

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I. INTRODUCTION

Quail is one type of poultry that has the potential to be developed. This potential is evidenced by the high public interest in consuming quail eggs. Quail has the advantage of fast production and high resistance to disease. However, in every smallholder livestock business, feed is a major problem in raising livestock. Feed costs are very high 60-80% of the total production costs [1]. The high cost for this feed is due to the fact that some of the feed ingredients are still imported. To reduce the cost of this feed, it is necessary to find local feed ingredients which are abundant and whose nutrients can still be utilized.

Local feed ingredients that can be used as feed in quail rations are palm kernel meal. Palm kernel meal is a by-product of palm kernel processing. In terms of availability, palm kernel meal is very abundant because Indonesia is the largest producer of palm oil, followed by Malaysia and Thailand. The total area of oil palm plantations in Indonesia reaches 14,030,573 hectares, with oil palm yields of 37,812,628 tons and palm kernel of 7,562,526 tons [2]. Meanwhile, from the nutrition, palm kernel cake is potential enough to be used as a feed ingredient. Palm kernel cake (PKC) contains 17.31% crude protein, 27.62% crude fiber, 7.14% crude fat, 0.27% Ca and 0.94% P and 48.04 ppm Cu [3]. Although the crude protein content of palm kernel cake is high, PKC contains high crude fiber, while poultry cannot utilize high amounts of crude fiber.

The high crude fiber in palm kernel cake in the form of β-mannan is 56.4% [4]. It is possible to reduce crude fiber in the form of food in the palm kernel cake. One way is by processing by fermentation. Fermentation is a feed processing technology using microorganisms. [5] carried out fermentation of PKC using *Bacillus subtilis* with a fermentation time of 6 days giving the best results, seen from its nutritional content (as feed) as follows: crude protein 24.65%, crude fiber 17.35%, nitrogen retention 68.47 % and the digestibility of crude fiber is 53.25%. Furthermore, it was also added in the same study which provided 24.27 U / ml mananase enzyme activity, 17.13 U / ml cellulase and 10.27 U / ml protease. Palm kernel cake fermented with *Bacillus subtilis* (PCKF) which is used up to a level of 25% in broiler chicken rations.

The results showed that fermented palm kernel cake using *Bacillus subtilis* was successfully used in broiler rations. For this reason, it is necessary to conduct research to determine the use of fermented palm kernel meal in rations as a local feed ingredient for quail (Coturnix coturnix japonica).

II. MATERIALS AND METHODS

Research material

The experimental poultry used in this study were 200 quail (Coturnix-coturnix japonica) aged 30 weeks. The cage used in this study is a box cage made of wire measuring 45x20x30 cm equipped with a place to eat, a place to drink and a base under the cage in the form of plywood to accommodate feces and a Weston scale with a capacity of 10 kg and a digital scale. The lighting tool used at night is 1 60 watt incandescent lamp. The cages are made of 20 units, each of which is filled with 10 quail.

Experimental design

The experimental design used in this study was an experimental method using a completely randomized design (CRD) consisting of 5 ration treatments with 4 repetitions. The treatment given was the use of different fermented palm kernel cake (PKCF) in the rations, consisting of R1 (0%), R2 (10%), R3 (15%), R4 (20%), and R5 (25%).

Fermented palm kernel cake

Comparison between palm kernel cake and bran (80%: 20%) to be used as a fermentation substrate [6]. The substrate was then added with distilled water as much as 70% and homogenized, sterilized in autoclave at 121 ° C for 15 minutes. Cooled to room temperature. The cooled substrate was inoculated with 7% Bacillus subtilis inoculum and stirred until homogeneous. Furthermore, the substrate was leveled at a thickness of 2 cm and incubated for 6 days in an incubator.

Composition and nutrition of treatment rations

Treatment rations were prepared with 20% (isoprotein) and 2800 kcal/g (isoenergy)[7]. Treatment rations were prepared using several feed ingredients: yellow corn, soybean meal, fine bran, fermented palm kernel meal, meat meal, bone meal, coconut oil, top mix and B12 minerals. The composition and nutrition of the rations for each treatment can be seen in Tables 1 and 2.

Table 1. Composition of treatment ration feed ingredients (%)

Ration Composer Materials	Treatment rations				
	R1	R2	R3	R4	R5
Yellow Corn	59	54,5	52,25	50,55	48,75
Soybean Meal	18	13,5	11,75	9,45	7,25
Fine Bran	7	6	5	4	3
PKCF	0	10	15	20	25
Meat Flour	11	11	11	11	11
Bone meal	2	2	2	2	2
Coconut oil	1	1	1	1	1
Top mix	0	0	0	0	0
Mineral B12	2	2	2	2	2
Total	100	100	100	100	100

Table 2. Nutrient treatment rations

Feed Substances	Treatment rations				
	R1	R2	R3	R4	R5
Crude protein (%)	20,30	20,18	20,30	20,22	20,17
Crude Fat (%)	4,46	4,50	4,50	4,51	4,52
Crude Fiber (%)	3,51	4,88	5,53	6,18	6,82
Calcium (%)	2,23	2,19	2,17	2,15	2,13
Phosphorus Available (%)	0,90	0,89	0,89	0,89	0,89
Energy Metabolism (Kcal/kg)	2825,44	2824,04	2826,58	2835,33	2842,96

Observed variables

Ration consumption (g / head / day): Ration consumption for laying quails can be measured by weighing the feed provided every week minus the remaining feed at the end of the week then divided by 7 days.

Egg Production (%): Egg production from quail can be calculated every day by dividing the number of quail alive on that day then multiplying by 100%.

Egg weight (g): Egg weight can be found by weighing the egg weight divided by the number of eggs produced.

Egg Mass (g/head/day): Egg mass is calculated from the amount of daily egg production (quail day production) multiplied by the weight of the egg produced.

Ration conversion: Conversion is obtained by dividing the total number of rations consumed for 1 day by the total egg mass for 1 day.
Eggshell Thickness (mm): The egg is cracked first, then the thickness of the shell is measured using a dial shell thickness on the pointed end, blunt end and middle part, then the results are averaged.

Data analysis

The data obtained were processed statistically by analysis of diversity according to [8]. If there are differences between the treatments, the DMRT (Duncan's Multiple Range Test) is carried out.

III. RESULT AND DISCUSSION

The effect of treatment on ration consumption, egg production, egg weight, egg mass, ration conversion and eggshell thickness had no significant effect (P> 0.05). The average ration consumption, egg production, egg weight, egg mass, ration conversion and eggshell thickness during the study can be seen in Table 3.

Table 3. Average ration consumption, egg production, egg weight, egg mass, ration conversion and eggshell thickness during the study

Paramaters	Treatments ration				
	R1	R2	R3	R4	R5
Ration consumption(g/head /day)	21.9	21.8	21.9	21,9	21.9
Egg Production (%)	60.60	59.82	59.60	57.81	57.14
Egg Mass (g / head / day)	7.64	7.64	7.50	7.48	7.48
Conversion of rations	2.86	2.86	2.92	2.93	2.92
Egg weight (g)	9.64	9.63	9.62	9.61	9.57
Eggshell Thickness (mm)	0.235	0.230	0.225	0.228	0.225

The treatment gave no significant effect of P> 0.05 on all observed variables.

Effect of treatment on ration consumption

Different from the fact that the consumption of laying quail rations by giving PKCF up to a level of 25% in the ration is caused by the type of feed given. The type of feed given in this study was the addition of fermented feed, namely PKCF. The addition of fermented feed ingredients in the ration has an effect on ration palatability and fermentation can increase the nutritional content of feed ingredients. In line with the opinion of [3] stated that fermented palm kernel cake can increase its palatability. [9] stated that Bacillus subtilis can improve the nutrition of feed ingredients.

Effect of treatment on egg production

There was no significant difference (P> 0.05) in the production of quail eggs by giving BISF up to a level of 25% in the ration due to the quality of palm kernel meal. Fermentation of palm kernel cake with 7% *Bacillus subtilis* inoculum can improve quality [5]. Although the administration of BISF with different levels in each treatment, the quality of the ration was in isoprotein and isoenergy. Giving BISF with different levels in each treatment was able to maintain protein and energy rations. The balance between protein and energy content will affect the production of quail eggs. This is in line with the opinion of [10] and [11] stated that quail production is strongly influenced by the protein and energy in the ration. [12] also stated that quail production is strongly influenced by protein and energy rations.

Not in fact quail egg production is also caused by ration consumption. The consumption of quail rations up to 25% of BISF in the ration had no significant effect. Consumption is a factor that can affect the production of quail. In line with [13] stated that ration consumption will affect egg production.

Effect of treatment on egg mass

The use of PKCF with *Bacillus subtilis* up to a level of 25% in quail rations had no significant effect (P> 0.05) on the mass of quail eggs. This is because egg production and egg weight produced in this study were not significantly different. Egg mass is influenced by egg production and egg weight. In line with the opinion of [14] stated that the mass of quail eggs is influenced by the production and weight of quail eggs. [15] stated that egg production and egg weight will affect egg mass.

Effect of treatment on ration conversion

The use of fermented palm kernel cake with *Bacillus subtilis* up to a level of 25% in quail rations had an insignificant difference (P> 0.05) on ration conversion. Based on the analysis, the use of PKCF up to a level of 25% in the ration can match the control ration conversion in quails. In fact, the conversion of quail rations using PKCF with *Bacillus subtilis* to a level of 25% was due to the fact that ration consumption and egg mass also had an insignificant effect, where the ration conversion was obtained from the ratio between ration consumption and egg mass. In addition, the conversion of the ration is also influenced by the ability of livestock to digest feed ingredients, the adequacy of feed substances for basic life, growth and the type of feed consumed. This is in line with [16] opinion and states that ration conversion is influenced by the type of feed consumed.

Effect of treatment on egg weight

Giving PKCF up to a level of 25% had no significant effect (P> 0.05) on the weight of quail eggs. This is because the product used has undergone fermentation. Fermented products have good nutritional quality and can increase the digestibility of rations. Increased digestibility of rations can increase ration consumption and nutrient intake for egg formation so that it affects egg weight. In line with [17] stated that providing fermented feed ingredients with good nutrition in quail rations can cause egg weight to be no different. Giving PKCF with *Bacillus subtilis* in the ration can improve the nutritional quality of the ration, especially protein, so that it can affect egg weight. Protein in each treatment feed serves as one of the factors that influence the formation of egg albumen and yolk formation which can also affect egg weight.

Effect of treatment on egg shell thickness

The use of PKCF with *Bacillus subtilis* up to a level of 25% in the ration gave no significant effect (P> 0.05) on the thickness of the quail egg shells. The unreal effect of quail egg shell thickness in each treatment showed that the rations containing PKCF up to a level of 25% had the same quality as the control ration, resulting in relatively the same eggshell thickness. Fermented products can increase mineral content, produce hydrolytic enzymes that make minerals easier for livestock to absorb. Minerals play an important role in the process of eggshell formation. In line with the opinion of [18] stated that minerals play a role in forming eggshells. [19] state that egg shells contain minerals.

IV. CONCLUSION

Fermented palm kernel meal with Bacillus subtilis can be used in the ration of laying quail as much as 25% with a ration consumption of 21.9 (g / head.day), egg production 57.14%, egg mass 7.48 g / head, ration conversion 2.92, egg weight 9.57 g and 0.225 mm eggshell.

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