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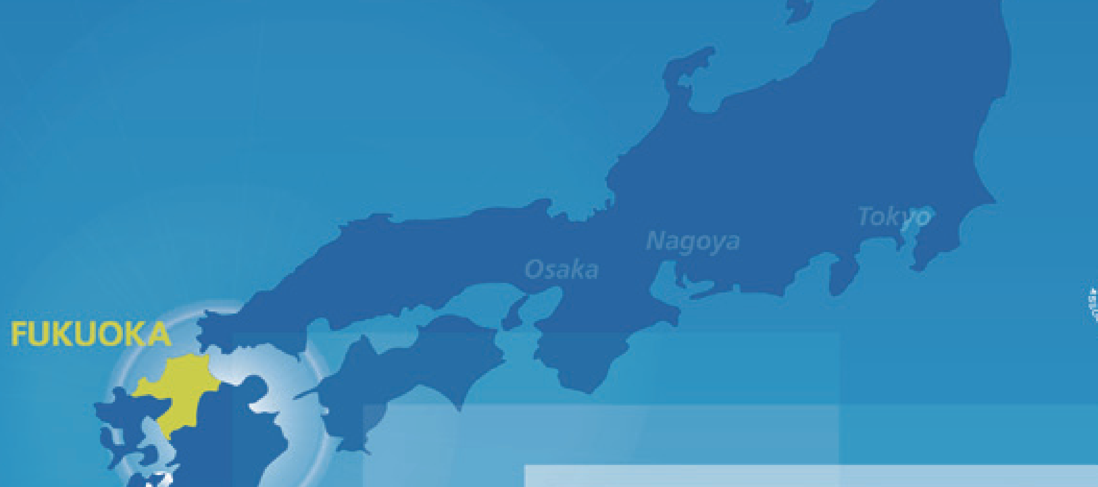

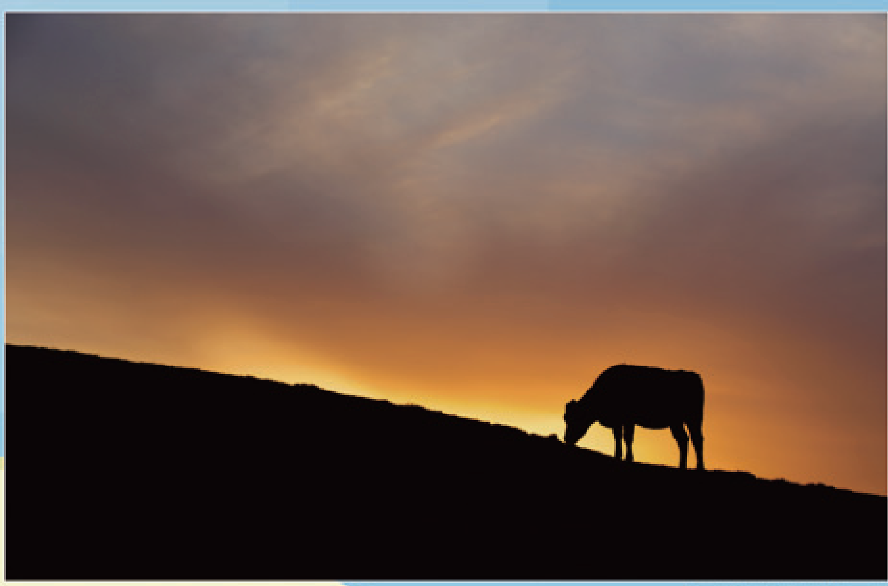

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THE EFFECTS OF UTILIZATION OF DIFFERENT PROCESSING TECHNIQUES OF SKIPJACK BONE MEAL IN THE RATION ON EGG PRODUCTION OF QUAIL

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ABSTRACT

A research was conducted to evaluate the effects of utilization of different processing techniques of skipjack fishbone (*Katsuwanus pelamis L*) meal in the diets on Japanese quail (*Coturnix coturnix japonica*) performance. The present study has been conducted for six weeks using 120 five weeks old quail birds. Experimental design used was a Completely Randomized Design with six treatments and four replications. Treatments were: (T_0) = *commercial bone meal* ; (T_1) = *Green fish bone meal* ; (T_2) = *Raw fish bone meal* ; (T_3) = *Steam fish bone meal* ; (T_4) = *Calcinated fish bone meal* ; and (T_5) = Special fish bone meal. The rations were formulated iso-protein and iso-energy. Variables measured were: feed consumption, average daily gain, feed efficiency ratio, hen day production, and egg weight. Research results showed that there were no significant effects (P>0.05) on feed consumption, average daily gain, hen day production, and feed efficiency ratio; but there was a significant effect (P<0.05) on egg weight. Feed consumption during the research were 944.07-951.51 g, daily gain were 49.71 - 50,90 g; hen day production were 42.86 - 46.79%; feed efficiency ratio were 0.53 - 0.56; and egg weight were 9.07 - 9.51 grams. Egg weight in T5 (special fishbone meal) was higher (9.51 g) compared with T_0 (9.07 g), and there were no significant different (P>0.05) among T5 and T_1, T_2, T_3, and T_4 . It can be concluded that different processing methods of fishbone as calcium sources in the diets did not influence feed consumption, daily gain, feed conversion ratio, hen day production, but T_5 (special fishbone meal) increased egg weight of Japanese quails.

INTRODUCTION

Laying hens or quail birds should be given proper calcium rich feed in their diet not only for the formation of egg shell but also for the high quality of egg shell, necessary for the prevention of breakage during handling and hatching. Quail birds require high calcium (Ca) and phosphorus (P) in the diet in order to provide enough Calcium and Phosphorus stored to be mobilized when needed at the peak egg production period. As in the case of hen, a deficiency of calcium in the diet of quails cause decline in egg production. One of the best calcium sources is fishbone as a waste product of canned fish in North Sulawesi, Indonesia (Bagau, 2012b).

Most of the canned fish produced in North Sulawesi, Indonesia are originated from *pelagis* fish (tuna, skipjack, and deho), left quite enough waste products. Solid waste which is consisted mostly of bone, produced about 8,2% from total fish canned (Bagau, 2012b). It is hipothesized that eventhough the fishbone is processed with different methods, the quality is still not much affected or still remain the same (Bagau, 2012c).

Raising quails provides livelihood and opportunity for income generation (Raymund, AL 2003). One of the areas that need particular attention is nutrition of the birds. The Japanese quail (Commix coturnix japonica) is the predominant breed being raised, largely for the production of table eggs (Amoah, *et al*., 2012).

Yet, little is known about the effects of a varying fishbone processing methods on bioavailability of Ca and P of quail birds. The present study was carried out to elaborate the effect of different processing techniques of skipjack (*Katsuwanus pelamis L*) fihbone in the diets on egg production of Japanese quails (*Coturnix coturnix japonica*).

MATERIALS AND METHODS

A total of 120 Japanese quail (*Coturnix coturnix japonica*) at an initial laying phase, aged 5 weeks were randomly divided into 24 experimental units of 5 chicks each and each diet was offered at random in each pen. Fresh water and feed were provided *ad libitum*throughout the experimental period. Birds were housed in an experimental cage for quails, with trough feeders and drinkers, grouped in galvanized wire cages with dimensions 33 × 33 × 14 cm. The lighting program was of 17 hours, provided as natural plus artificial illumination.

The dietary treatments were in a Completely Randomized Design with 6 treatments and 4 replications (Steel and Torrie, 1990). Each treatment was replicated four times. Each replicate had five birds. Treatments were skipjack (*Katsuwanus pelamis L*) fishbone meal from "PT. Nichindo Manado Suisan" Amurang, South Minahasa Regency, processed and arranged into each treatment as follow: T_0 = commercial bone meal (as a control); T_1 = green fishbone meal; T_2 = raw fishbone meal; T_3 = steam fishbone meal; (T_4) = calcinated fishbone meal; and T_5 = special fishbone meal.

Diets (Table 1) were formulated to meet the requirement of quails according to the National Research Council (NRC, 1994). The birds were raised under standard management conditions and feed and water were supplied *ad libitum* throughout the experimental period.

Feed intake was determined from the weight difference obtained between the amounts of feed provided at the beginning and leftovers at the end of 42 days period. Egg production was calculated by the ratio of number of eggs produced by the number of birds housed in the period, multiplying the value by one hundred. Feed conversion was calculated by dividing the feed intake (kg/bird) by the number of eggs produced.

Data collection

The performance characteristics monitored were: feed intake, body weight gain, and feed conversion ratio (FCR), hen day production, and egg weight. Feed intake and weight gain were recorded at the end of the experiment and feed conversion ratio (FCR) was calculated.

Eggs were weighed individually in a digital three-digit scale (0.001g) (Shimadzu, model BL-320H) and the values obtained were used for the calculation of the average egg weight.

Statistical analysis

The experimental feed samples were analyzed as described by AOAC (2005). The results were analyzed by General Linear Model (GLM) and Tukey's significant difference test was used to compare means (Steel and Torrie, 1990).

RESULTS AND DISCUSSION

The data obtained during the experimental period for different parameters were analyzed and the results were presented in Table 3. These findings indicated that improvement in performance of quails in both early and post peak production period can be achieved with dietary calcium level higher than the 2.5% recommended by the NRC (1994). The treatment diets in the present study have a calcium level of 2,12% (Table 2), which were slightly below the above recommended level.

The data presented in Table 3 showed that different fishbone meal sources in the diets did not influence (P>0.05) daily feed consumption, daily weight gain, feed conversion ratio, and hen day production. Egg weight was the only parameter measured that gave a significant different (P<0.05) among treatments. T5 (special fishbone meal) significantly (P<0.05) gave the highest egg weight compared with other treatments. As proposed at the beginning of the study that different methods of fishbone meal processing will result in the quality that is not much affected.

Feed consumption and feed conversion ratio of quails were both statistically similar and averaged 952.35 g/day and 0.54, respectively. Hen day production of quails was also similar and averaged 44.52%. The results also indicated that there was no significant (P>0.05) effect of different methods of fishbone processing irrespective of calcium sources on hen day production per day. The similarity of egg production revealed that different methods of fishbone processing as calcium sources in quails diets had no effect on hen day egg production. This result is in agreement with some previous research findings. Scheideler (1998), Makled and Charles (1987) observed that egg production did not significantly (P>0.05) differ due to various calcium sources. Florescu *et al*. (1986) supplied dietary calcium from various sources and found no significant different in egg production.

Average daily gain body weight of quails were statistically similar and averaged 50.18 g/day during trial period. At the end of the experiment result showed that body weight gain gave non significant (P>0.05) increased for every treatment irrespective of different fishbone processing methods. Cheng and Coon (1990), supplied dietary calcium from various sources and found no significant different in body weight and egg production. Oliveira *et al.* (1997), supplied dietary calcium from different sources and found no significant different in egg production and body weight.

Egg weight on different treatments (Table 3) was significantly (P<0.05) different. Egg weights on different fishbone processing methods were 9.07 g for T_0 (commercial bone meal); 9.33 g for T_1 (green fishbone meal); 9.37 g for T_2 (raw fishbone meal); 9.33 g for T_3 (steam fishbone meal); 9.36 g for T_4 (calcinated fishbone meal); and 9.51 for T_5 (special fishbone meal). Egg weight in the current finding is in agreement with some researchers. Sultana, *et al*., (2007) reported that giving different sources of calcium in quail diets and found that egg weight was ranged from 9.74 - 10.24 g.

Lack of influence on dietary calcium sources on egg weight obtained in current finding is in agreement with some researchers. Richter *et al.* (1999) used dietary calcium from various source and found no significant difference in egg weight. Scheideler (1998) and Rabon *et al.* (1991) also observed that egg weight did not significantly differ due to various calcium sources.

Egg weight in the present study was significantly different ($P<0.05$) amongst treatment or amongst different fishbone processing methods. T5 (special fishbone) gave the highest ($P<0.05$) egg weight compared with other treatments. It is proposed that high egg weight in T5 (special fishbone) due to processing method employed on this treatment. Special fishbone was hydrolyzed by using NaOH 4% for 48 hours (as in Bagau, 2010 and 2012 procedures) to remove all collagen in the fishbone, so that calcium is in the form of available calcium for better used in quail diets.

CONCLUSION

Different processing methods of fishbone as calcium sources in the diets did not influence feed consumption, daily gain, feed conversion ratio, hen day production, but T_5 (special fishbone meal) increased egg weight of Japanese quails.

Table 1. Nutrient composition of feedstuffs used in the diets

Feedstuffs	Protein (%)	Crude Fiber (%)	Ether extract (%)	Ca (%)	P (%)	Energy (kcal/kg)
Yellow corn	9.42	2.15	5.17	0.22	0.60	2.983
Soybean meal	40.38	6.56	9.91	0.24	0.58	2.540
Copra meal	24.74	15.02	9.36	0.11	0.47	3.279
Fish meal	58.52	2.95	13.90	7.04	3.67	3.851
Rice bran	13.44	6.35	6.07	0.19	0.73	2.695
Commercial fishbone (T_0)				26.21	10.79	
Green bone meal (T_1)				22.99	10.14	
Raw bone meal (T_2)				24.61	10.05	
Steam bone meal (T_3)				29.12	12.17	
Calcinated bone (T_4)				30.89	13.14	
Special bone meal (T_5)				29.83	12.12	

Table 2. Ingredients and Nutrients Composition of the Ration

Ingredients	T0	T1	T2	T3	T4	T5
Yellow corn	53	53	53	53	53	53
Soybean meal	10	10	10	10	10	10
Copra meal	9	9	9	9	9	9
Fish meal	15	15	15	15	15	15
Rice bran	9	9	9	9	9	9
Fishbone meal	3	3	3	3	3	3
Topmix[**)]	1	1	1	1	1	1
Total	100	100	100	100	100	100
Nutrient composition	T0	T1	T2	T3	T4	T5
Crude protein (%)	21.24	21.24	21.24	21.24	21.24	21.24
Ether extract (%)	7.20	7.20	7.20	7.20	7.20	7.20
Crude fiber (%)	4.16	4.16	4.16	4.16	4.16	4.16
Ca (%)	2.01	1.91	1.96	2.10	2.15	2.12
P (%)	1.36	1.34	1.34	1.40	1.43	1.39
Metabolizable Energy (kcal/kg)	2950.80	2950.80	2950.80	2950.80	2950.80	2950.80

[*)] Calculated based on Table 1.

Table 3. Performance characteristics of Japanese quails fed six different fishbone meal in the diets

Parameters	Treatments					
	T0	T1	T2	T3	T4	T5
Feed consumption (g)	951.51	951.09	947.94	959.89	944.07	959.61
Daily gain (g)	49.88	49.85	50.02	50.72	49.71	50.90
Feed conversion ratio	0.53	0.55	0.55	0.54	0.56	0.56
Hen day production (%)	44.29	44.29	45.36	43.57	42.86	46.79
Egg weight (g)	9.07[a]	9.33[ab]	9.37[b]	9.33[ab]	9.36[ab]	9.51[b]

[a, b,] Means on the same row with different superscripts differ significantly ($P < 0.05$)

KEYWORD：fish, bone, egg, production, quail

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