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Original Article

Provision of milkfish (*Chanos chanos*) waste flour as a commercial feed substitute for feed consumption and carcass percentage of Japanese quail (*Coturnix coturnix japonica*)

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ABSTRACT

The purpose of this research was to determine the substitution of milkfish (*Chanos chanos*) waste flour can increase feed consumption and carcass percentage of Cortunix cortunix japonica. There are 20 quails (*Coturnix coturnix japonica*) of four treatments and five replications. Each treatment consisted by five quails. The treatment consisted of P0 with commercial feed 100%, P1 with commercial feed 98% + milkfish waste flour 2%, P2 with commercial feed 96% + milkfish waste flour 4%, and P3 with commercial feed 94% + milkfish waste flour 6%. Based on the results of the Analysis of Variance (ANOVA) there was significantly different ($p<0.05$) on feed consumption and carcass percentage. It can be concluded the substitution of commercial feed with milkfish (*Chanos chanos*) waste flour can increase feed consumption and carcass percentage of Japanese quail.

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Introduction

The poultry sector that has the potential to be developed is the Japanese quail (*Coturnix coturnix japonica*) (Nasar *et al*., 2016). Said *et al.* (2018) stated that quail is one of the most popular livestock because it can meet the needs of animal protein for the community. One of the animal proteins from quail that can be utilized by the community is meat (Quaresma *et al*., 2022). The quail used as meat quail are male quail and female quail that have been retired (Goto *et al*., 2023).

Feed is a very important and fundamental thing in sustaining the life of livestock, besides playing a role of 60-70% in the expenditure of livestock business costs (Herrero *et al*., 2013). The main source of protein in poultry feed is fishmeal with essential amino acid content that cannot be synthesized in the body. Indonesia still has difficulty meeting domestic demand for fishmeal, so it requires imports of fishmeal (Herrero *et al*., 2013). The high price of raw materials causes production costs to increase. Farmers are looking for inappropriate solutions to reduce production costs, farmers reduce the portion of feed or choose feed with low nutritional content (Jarman *et al*., 2023).

Quail maintenance requires good feed management supported by sufficient protein. This protein will support the growth and development of quail performance, especially in increasing weight gain and feed consumption (Retes *et al*., 2022). Quail that lack nutrition causes a decrease in carcass weight. Carcass is the slaughter of livestock to produce a body without feathers, entrails (internal organs), head,

neck, and both legs (feet) (Arif *et al*., 2022). Slow carcass growth causes losses for farmers because carcasses are an important indicator of the success of a poultry farm. Carcasses are a benchmark for comparing the capital used in livestock maintenance with the amount or quantity of meat produced (Treich, 2021).

The above reality requires proper thinking to obtain alternative feed ingredients that are economical, have good nutritional content, are easy to obtain and do not compete with human food needs. One alternative feed ingredient is fisheries industry waste. Fisheries waste that can be used as feed ingredients is milkfish waste (Sandeep *et al*., 2022). Milkfish waste is waste from the fisheries industry that has not been utilized properly so that it continues to increase along with the development of the fisheries industry and the level of fish consumption in households (Kruijssen *et al*., 2020). Milkfish waste that has the potential to be developed includes bones and scales. Milkfish bones (*Chanos chanos*) cannot be decomposed in nature because they have a hard structure so that they become waste (Mozumder *et al*., 2022). Milkfish bone and scale waste among the community is one of the materials whose use is not optimized because the community is more dominant in utilizing milkfish meat (Sandeep *et al*., 2022).

Kalanganyar is the largest milkfish commodity producing village in East Java. In Kalanganyar village itself, there are many ponds that provide milkfish fishing services with various prices ranging from 30,000 - 50,000 rupiah per kilogram. After catching fish, anglers look for bone removal services that are widely available around the pond to remove the milkfish bones and grill the fish to eat with their families, for bone removal services the usual rate is 3000 rupiah per fish. Many of the bone waste is thrown away and not utilized, therefore this waste was tried to be utilized for this study. The purpose of this study was to determine the utilization of milkfish waste flour (*Chanos chanos*) as a substitute for commercial feed on feed consumption and carcass percentage of Japanese quail (*Coturnix coturnix japonica*).

Materials and methods

Research design

This type of research is an experimental research with a research design of "Post-test Only Control Group Design" using a Completely Randomized Design (CRD). The sample used in this study was female Japanese quail (*Coturnix coturnix japonica*) since one day old or Day Old Quail (DOQ). The number of replications used for each treatment group was 5 replications with each replication containing 1 quail so that the sample size used was 20 Japanese quail (*Coturnix coturnix japonica*).

Adaptation phase

Quail adaptation in this study was divided into two parts, namely environmental adaptation and feed adaptation. The environmental adaptation phase was carried out when the quail were 1-7 days old. During this period, the quail were given commercial feed ad libitum, while the feed adaptation phase was carried out when the Japanese quail were 8-14 days old. Japanese quail began to be treated at the age of 15 days and were kept for 40 days until they were 55 days old. During this period, the control group of quail (P0) was given commercial feed without additional milkfish waste flour. In the quail treatment groups P1, P2, and P3, milkfish waste flour was added to the commercial feed with increasing concentrations with a one-day gap for a week. Japanese quail were fed twice a day, namely morning and evening.

Treatment phase

In this study, Japanese quails were started at 15 days old, so the duration of the treatment phase ranged from 15-55 days of age of Japanese quails. The provision of treatment feed in each group per replication was carried out based on the following treatment doses:

P0: Japanese quail with 100% commercial feed.
P1: Japanese quail with 2% milkfish waste flour and 98% commercial feed.
P2: Japanese quail with 4% milkfish waste flour and 96% commercial feed.
P3: Japanese quail with 6% milkfish waste flour and 94% commercial feed.

Data collection phase

The harvest phase or data collection related to this study using variables, namely carcass percentage, was carried out one day after the research period ended (day 55). Carcass percentage data can be taken when the quail has been slaughtered.

Feed consumption data is a comparison between the feed given and the remaining feed the next day. Weighing the feed given and the remaining feed is carried out every day which is then calculated to obtain total feed consumption during the treatment, with the following feed consumption formula:

Feed Consumption (g) = Feed Given (g) - Remaining Feed (g)

Carcass percentage data can be taken when the quail has been slaughtered. The carcass percentage can be calculated after the final live weight is known.

Data analysis

Carcass percentage and feed consumption data were analyzed statistically using one way Analysis of Variance (ANOVA) with SPSS for Windows 20.0 program to see the real differences of each treatment group. If there is an effect, then Duncan's multiple range test is continued with a significance level of $\alpha = 0.05$ to determine the treatments that provide the highest and lowest results.

Result

Feed consumption

Quail feed consumption for each treatment during the study is presented in table 1.

Table 1. Mean and standard deviation of quail feed consumption

Treatment	Mean ± Standard Deviation (grams)
P0	$1235.00^{a} \pm 17.45$
P1	$1258.60^{b} \pm 9.13$
P2	$1270.20^{bc} \pm 13.10$
P3	$1281.60^{c} \pm 3.78$

Note: Different superscripts in columns P0, P1, P2, P3 indicate a significant difference ($p<0.05$)

Feed consumption from the four types of treatments and five repetitions during the study showed the results of the SPSS ANOVA method test, namely that there was a significant difference ($p <0.05$) in quail during the administration of milkfish waste treatment. Group P0 showed the smallest average quail feed consumption of 1235 grams and group P3 showed the largest average quail feed consumption of 1281.6 grams. In treatment P0, it was significantly different from treatments P1, P2, and P3. Treatment P1 was not significantly different from P2, but was significantly different from P0 and P3.

Carcass percentage

The percentage of quail carcasses for each treatment during the study is presented in table 2.

Table 2. Mean and standard deviation of quail carcass percentage

Treatment	Mean ± Standard Deviation (grams)
P0	$52.33^{a} \pm 3.00$
P1	$57.92^{b} \pm 5.15$
P2	$58.56^{b} \pm 2.65$
P3	$60.35^{b} \pm 5.05$

Note: Different superscripts in columns P0, P1, P2, P3 indicate a significant difference ($p<0.05$)

The average percentage of carcasses from the four types of treatments and five replications during the study showed the results of the SPSS ANOVA method test, namely that there was a significant difference ($p <0.05$) in quail during the administration of milkfish waste treatment. Group P0 showed the smallest percentage of quail carcasses of 52.33% and group P3 showed the largest average of quail carcasses of 60.35%. In treatment P0, it was significantly different from P1, P2 and P3. Treatment P1 was not significantly different from P2 and P3, but was significantly different from P0.

Discussion

Feed consumption

Feed has an important role to ensure the survival of livestock. Feed consumption is influenced by age, strain, body size, palatability,

livestock health, livestock type, livestock activity, quality of feed given, disease and environmental temperature (Puzio *et al*., 2019).

The average feed consumption of quails given commercial feed substitution with milkfish waste meal for 41 days of control treatment P0 and milkfish waste meal of P1 2%, P2 4%, P3 6% respectively of P0 1231.6 g/head, P1 1238.4 g/head, P2 1261.8 g/head, P3 1278.6 g/head and the results of the study showed a significant difference ($p<0.05$) between the treatments given to increasing feed consumption of quails. High consumption figures can be influenced by the level of palatability of quails to the feed substitution given which indicates that the addition of milkfish waste meal has high palatability, so that quail feed consumption is said to increase.

The protein content and metabolic energy contained in the feed greatly affect the level of feed consumption (Fang *et al*., 2019). Quail feed consumption is related to the amount of energy used to meet basic living needs for quail production. Llonch *et al*. (2018) said that the feed consumed will affect the production capacity of the livestock that eats it. Excessive energy consumed will be stored in the form of fat which can interfere with livestock productivity. The energy in the feed cannot be used entirely by quail, because some will be excreted through feces and urine.

Carcass percentage

Quail is a poultry that according to its physiological condition is not able to consume too much crude fiber. According to Ye *et al*. (2017), crude fiber or cellulose is one source of energy, but the crude fiber content cannot be digested by poultry because in its digestive tract poultry does not have the cellulase enzyme that can digest crude fiber and the crude fiber content only provides bulky in the ration. Quail tends to increase drinking water consumption if the crude fiber content is high (Suharyanti *et al*., 2021).

High crude fiber will reduce the efficiency of other nutrient use, conversely if the percentage of crude fiber contained in the ration is very low then the ration cannot be digested perfectly (Lattimer and Haub, 2010). The high content of crude fiber in feed will affect the digestion process in the digestive tract to be shorter and reduce digestibility (Tejeda and Kim, 2021).

The percentage of final carcass at the time of harvest was obtained the average percentage of carcass at P0 (52.33%), P1 (57.92%), P2 (58.56%) and P3 (60.35%). This shows that the provision of milkfish waste flour substitution treatment has the effect of increasing the percentage of carcass significantly, as evidenced by the increasing dose of milkfish waste flour up to 6% having the highest carcass percentage value compared to other treatments. The results of the study showed a significant difference ($p <0.05$) between the provision of treatments given to the increase in the percentage of carcasses from quail.

This is possible due to the use of milkfish waste flour which is one of the sources of protein for muscle formation and most importantly in the poultry grower phase which in this study used Japanese quail. This is in accordance with Kokoszyński *et al*. (2019) who explained that the percentage of carcass is determined by the percentage of carcass obtained, as well as the thigh and chest muscle development system related to gender, age and body weight.

Milkfish waste flour used in this study as a source of protein has a good effect on increasing growth and is used to increase the weight of Japanese quail. This milkfish waste flour will affect the physical condition of Japanese quail in this study. This was added by Mohanty *et al*. (2014) who said that fish meal as a source of protein, essential amino acids such as arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine are very good for livestock growth. The results of this study are in accordance with the opinion of Lee *et al*. (2020) that different protein content in feed can affect carcasses because muscle formation requires protein. This is related to the difference in doses given which have a significant effect in this study starting from doses of 2%, 4% and 6% milkfish waste flour in the commercial feed given.

Amoozmehr *et al*. (2023) explained that low energy content in feed causes protein digestibility to decrease and inhibits the growth rate of poultry. Furthermore, according to Ajomiwe *et al*. (2024) added that protein is the most important component in feed that determines body growth and livestock reproduction. It can be concluded that protein is one of the sources of energy that is greatly needed by livestock in their growth. Poultry growth in the starter phase and grower phase has increasing levels of growth hormone (GH), so that in livestock that are given good and sufficient feed, it will provide an optimum effect on the growth of Japanese quail in this study.

Conclusion

Based on the research results, it can be concluded that giving milkfish waste flour (*Chanos chanos*) as a substitute for commercial feed at a dose of 6% can increase feed consumption and carcass percentage of Japanese quail (*Coturnix coturnix japonica*).

References

Ajomiwe N, Boland M, Phongthai S, Bagiyal M, Singh J, Kaur L. Protein Nutrition: Understanding Structure, Digestibility, and Bioavailability for Optimal Health. Foods. 2024; 13(11): 1771.

Amoozmehr A, Dastar B, Ashayerizadeh O, Mirshekar R, Abdollahi MR. Effect of feed form and nutrient density on growth performance, blood parameters, and intestinal traits in broiler breeder pullets. Poult Sci. 2023; 102(7): 102700.

Arif M, Baty RS, Althubaiti EH, Ijaz MT, Fayyaz M, Shafi ME, Albaqami NM, Alagawany M, Abd El-Hack ME, Taha AE, Salem HM, El-Tahan AM, Elnesr SS. The impact of betaine supplementation in quail diet on growth performance, blood chemistry, and carcass traits. Saudi J Biol Sci. 2022; 29(3): 1604–1610.

Fang LH, Jin YH, Do SH, Hong JS, Kim BO, Han TH, Kim YY. Effects of dietary energy and crude protein levels on growth performance, blood profiles, and nutrient digestibility in weaning pigs. Asian-Australas J Anim Sci. 2019; 32(4): 556–563.

Goto T, Konno S, Konno M. Establishment of Wild-Derived Strains of Japanese Quail (*Coturnix japonica*) in Field and Laboratory Experiments. Biology (Basel). 2023; 12(8): 1080.

Herrero M, Grace D, Njuki J, Johnson N, Enahoro D, Silvestri S, Rufino MC. The roles of livestock in developing countries. Animal. 2013; 7(Suppl 1): 3–18.

Jarman A, Thompson J, McGuire E, Reid M, Rubsam S, Becker K, Mitcham E. Postharvest technologies for small-scale farmers in low- and middle-income countries: A call to action. Postharvest Biol Technol. 2023; 206(1), 112491.

Kokoszyński D, Wasilewski R, Saleh M, Piwczyński D, Arpášová H, Hrnčar C, Fik M. Growth Performance, Body Measurements, Carcass and Some Internal Organs Characteristics of Pekin Ducks. Animals (Basel). 2019; 9(11): 963.

Kruijssen F, Tedesco I, Ward A, Pincus L, Love D, Thorne-Lyman AL. Loss and waste in fish value chains: A review of the evidence from low and middle-income countries. Glob Food Secur. 2020; 26(1): 100434.

Lattimer JM, Haub MD. Effects of dietary fiber and its components on metabolic health. Nutrients. 2010; 2(12): 1266–1289.

Lee YH, Ahmadi F, Lee M, Oh YK, Kwak WS. Effect of crude protein content and undegraded intake protein level on productivity, blood metabolites, carcass characteristics, and production economics of Hanwoo steers. Asian-Australas J Anim Sci. 2020; 33(10): 1599–1609.

Llonch P, Mainau E, Ipharraguerre IR, Bargo F, Tedó G, Blanch M, Manteca X. Chicken or the Egg: The Reciprocal Association Between Feeding Behavior and Animal Welfare and Their Impact on Productivity in Dairy Cows. Front Vet Sci. 2018; 5(1): 305.

Mohanty B, Mahanty A, Ganguly S, Sankar TV, Chakraborty K, Rangasamy A, Paul B, Sarma D, Mathew S, Asha KK, Behera B, Aftabuddin M, Debnath D, Vijayagopal P,

Sridhar N, Akhtar MS, Sahi N, Mitra T, Banerjee S, Paria P, Das D, Das P, Vijayan KK, Laxmanan PT, Sharma AP. Amino Acid compositions of 27 food fishes and their importance in clinical nutrition. J Amino Acids. 2014; 2014(1): 269797.

Mozumder MMH, Uddin MM, Schneider P, Raiyan MHI, Trisha MGA, Tahsin TH, Newase S. Sustainable Utilization of Fishery Waste in Bangladesh—A Qualitative Study for a Circular Bioeconomy Initiative. Fishes. 2022; 7(2): 84.

Nasar A, Rahman A, Hoque N, Kumar Talukder A, Das ZC. A survey of Japanese quail (*Coturnix coturnix japonica*) farming in selected areas of Bangladesh. Vet World. 2016; 9(9): 940–947.

Puzio N, Purwin C, Nogalski Z, Białobrzewski I, Tomczyk Ł, Michalski JP. The effects of age and gender (bull vs steer) on the feeding behavior of young beef cattle fed grass silage. Asian-Australas J Anim Sci. 2019; 32(8): 1211–1218.

Quaresma MAG, Antunes IC, Ferreira BG, Parada A, Elias A, Barros M, Santos C, Partidário A, Mourato M, Roseiro LC. The composition of the lipid, protein and mineral fractions of quail breast meat obtained from wild and farmed specimens of Common quail (*Coturnix coturnix*) and farmed Japanese quail (*Coturnix japonica domestica*). Poult Sci. 2022; 101(1): 101505.

Retes PL, Neves DGD, Bernardes LF, Alves VV, Gonçalves NC, Lima DR, Alvarenga RR, Pereira BA, Seidavi A, Zangeronimo MG. Dietary crude protein levels during growth phase affects reproductive characteristics but not reproductive efficiency of adult male Japanese quails. Anim Biosci. 2022; 35(3): 385–398.

Said MI, Abustam E, Pakiding W, Mide MZ, Basri S. Physical characteristics of quail (*Coturnix coturnix*) meat given hydrolyzed feather meal from broiler at different levels. IOP Conf Ser Earth Environ Sci. 2019; 247(1): 012003.

Sandeep KP, De D, Kumar S, Raja RA, Mahalakshmi P, Suvana S, Sivaramakrishnan T, Ambasankar K, Vijayan KK. Effect of fish waste hydrolysate on growth performance and health status of milk fish (*Chanos chanos*) and its potential to reduce feed. Aquaculture. 2022; 550(1): 737834.

Suharyanti, Ridla M, Wijayanti I, Mutia R. Enzim suplementation in the quail (*Coturnix coturnix Japonica*) diet containing Indigofera Zolingeriana on performance and metabolizable energy. J. Ilm. Peternak. 2021; 31(2): 140–148.

Tejeda OJ, Kim WK. Role of Dietary Fiber in Poultry Nutrition. Animals (Basel). 2021; 11(2): 461.

Treich N. Cultured Meat: Promises and Challenges. Environ Resour Econ (Dordr). 2021; 79(1): 33–61.

Ye M, Sun L, Yang R, Wang Z, Qi K. The optimization of fermentation conditions for producing cellulase of Bacillus amyloliquefaciens and its application to goose feed. R Soc Open Sci. 2017; 4(10): 171012.