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EFFECT OF MUSSEL (*Perna viridis*) MEAL ON THE PRODUCTION AND QUALITY OF QUAIL (*Coturnix coturnix japonica*) EGG

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ABSTRACT

This study aimed at evaluating the effect of Mussel or Tahong (Perna viridis) meal on the production and quality of quail egg. There were 48 Japanese quail (Coturnix coturnix japonica) utilized in the study. The experiment was laid out in a Complete Randomized Design (CRD) with four treatments replicated three times. The levels of Tahong Meal (TM) concentration in the ration of the quails varied in each treatment; T_1 0% (control), T_2 (10% TM), T_3 (20% TM) and T_4 (30% TM). The following production performance and egg quality were evaluated in terms of Average Hen-Housed Egg Production (AHHEP %), Average Hen-Day Egg Production (AHDEP %), Average Egg Strength (AES g), Average Eggshell Weight (AEW g), Average Daily Feed Intake (ADFI g), Average Body Weight (ABWG g) and Average Feed Conversion Efficiency (AFCE g/dozen).Results revealed that the inclusion of Tahong Meal to the feeds of the laying quails had a significant impact on the Hen-Housed Egg Production, Hen-Day Egg Production, Egg Strength, Eggshell Weight, Body Weight and Feed Conversion Efficiency. Tahong meal supplies the daily calcium needs of the laying quails. However, only a maximum of 20% Tahong meal substitution can give an utmost strength of an egg. The 10% level of Tahong meal gave the highest egg production and contributed positive effect on the eggshell quality. The Mussels as indigenous shells in Panguil Bay will only be used as human foods but as a good source of calcium for the poultry egg production.

Keywords: Japanese quail *(Coturnix coturnix japonica),* Tahong *(Perna viridis),* egg quality performance.

Introduction

The quality of the egg is one of the determinants of the consumers to purchase the product. A quality product can be immediately identified through the common senses. However, quality is perceived to be different from the point of view of the individual buyers. A clean, well-formed egg, without visible cracks, spots, or other deformities ensure high acceptance by consumers. It is a fact that buyers are at distant from the poultry farms. So the eggs need to be transported to the retailers or to the end users. During transportation, the loss due to breakage is always a problem. So, the thickness of the eggshell is always being considered by the producers. This study then claimed that feeding plays a vital role in the eggshell quality.

According to the Halls (n.d.), six to eight percent of all eggs produced commercially are unusable because of shell quality issues. Gupta (2008) cited that two to five percent of eggs are lost due to form which may be shell-less, cracked or broken to the extent that they are not suitable for collection. He said further that another 3-8% is lost during collection, moving through the belts, cleaning, packing and transportation to the end user. As one solution to the problems, improved practices in feeding are being considered. In fact, feeding is one of the most important activities in egg production. The quality of eggs depends on the kind of feeds given. One major factor that affects the eggshell formation is the rate of calcium deposition on the eggshell during the egg formation process, (Koelkebeck, 1999). According to Butcher and Richards (2014), the calcium requirement of the laying hen is great. It can be calculated that during the 20 hours requirement to form an eggshell, 25 milligrams of calcium must be deposited on the egg every 15 minutes. This amount of calcium is the total amount of calcium in a normal hen's circulatory system at any given point in time. The laying hen is also not 100% efficient in extracting calcium from the available sources in the diet. Therefore, many times the diet has to furnish in excess of 4 grams of calcium to the hen daily. Calcium availability values are sometimes not known and it must be remembered that higher daily intakes are needed when the availability values are known to be low.

There are indigenous marine resources which are also high in calcium. One of them is Tahong *(Perna viridis).*Tahong contains 63.94% CP, 9.45% Crude Fat, 0.06% Crude Fibre, 0.305% Calcium and 0.894% Phosphorus (Rochanaburanon, 1980). This means that it can be an ingredient of the feeds for laying like quail. This must be explored as one way to reduce the high cost of production. The Tahong is given lesser attention by man, due to unavailability of any scientific literature about its usefulness for animal feeding. However, it is very abundant in the Panguil Bay of Tangub City.

For this reason, a study was conducted to provide better insight into the eggshell quality of quail fed with ground *Tahong.* Specifically, this study aimed to determine the hen-housed egg production, hen-day egg production, egg strength, eggshell weight, daily feed intake, body weight gain and feed conversion efficiency (per dozen eggs).

Materials and Methods

The Experiment. The experiment was conducted at the NMSCST poultry project (Northwestern Mindanao State College of Science and Technology, Labuyo, Tangub City) for 57 days. The study was laid out in a Complete Randomized Design (CRD) with four treatments replicated three times. There were four experimental treatments comprising the different percentage levels of Tahong Meals such as 0%(T_1), 10%(T_2), 20%(T_3) and 30%(T_4). These were substituted to the dietary ration of the birds. The study used a commercial chick booster mash having 24% CP content as a control.

There were 48 60-day old birds selected randomly out of the 200 reared quails. Each treatment had three replications with 4 birds. The birds were fed up to 57 days. This study used *ad libitum* method of feeding and the birds were given 24 hours of lighting duration per day.

A week before the study started, the poultry building and equipment that were used in the experiment were thoroughly cleaned and disinfected with **"BIOSAFE".** Lighting facilities were installed. Poultry equipment such as feeding troughs, drinking troughs and other necessary materials were prepared.

Measures of Parameters

Hen-Housed Egg Production. HHEP measures the effects of both egg production and mortality. If there is no mortality during a period, the HDEP and HHEP are equal. It is obtained by this formula:

$$\text{HHEP} = \frac{\text{Total number of eggs laid during the period}}{\text{Total number of hens housed at the beginning of laying period}} \times 100$$

Hen-Day Egg Production. HDEP is usually expressed in percentage. It is mostly used for the scientific studies and truly reflects the production capacity of the available birds in the house. It is obtained by this formula:

$$\text{HDEP} = \frac{\text{Total number of eggs produced during the period}}{\text{Total number of hen-days in the same period}} \times 100$$

Egg Strength. The egg strength was measured every week from the first to 8th week of the experimentation. Four eggs were randomly selected among the laid eggs in each replication. The egg strength was determined by placing 4 eggs (at a distance of 4 inches from each other) in square plywood (10 x 10 in.). Another piece of plywood was placed on the top of the eggs having the same size with the base plywood. A cylindrical plastic container with ground rock (r = 6.25 in; h= in) were then placed at the top of the plywood. A tin can(r= 3 in; h = 6.75 in) was put on the plastic container. It was then slowly filled with sand until the four eggs were cracked. All of those load carried by the eggs on the top such as the plywood, plastic container, ground rock, tin can and the sand were weighed using a measuring scale with a capacity of 10 kg to measure the egg strength.

$$ES = \frac{\text{Total egg strength}}{\text{Total number of eggs}}$$

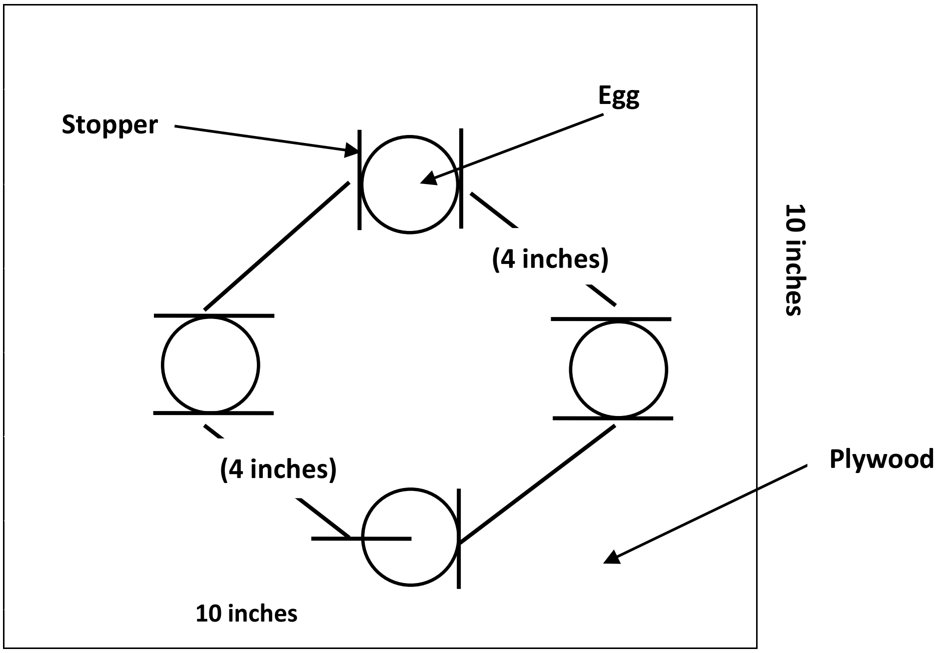

Figure 1. An illustration of egg strength determination.

Eggshell Weight. The collection of the eggshell weight was done weekly starting from the first week of the experiment up to the last week and analytic weighing scale to have a more accurate result. The eggs were randomly selected among the laid eggs of the quail in the week in each treatment's replication; a total of three eggs per replication in each treatment were used.

Daily Feed Intake. This is the measure of the amount of feed consumed by one quail per day of the entire observation. It was obtained by subtracting the remaining feeds in the sack to the initial weight of the feeds prior to the start of the experiment per replication divided by the number of quails in the cage all over the number of experimental days.

Body Weight Gain. The body weight gain was measured by subtracting the initial weight of the quails from their final weight. The initial weight is equal to the weight of the experimental animals before the time they are fed with its experimental rations while the final weight was measured from the weight of the birds at the end of the feeding period.

Feed Conversion Efficiency. This takes into consideration of the feed intake and egg production. It is the ratio between the feed consumed and the number of eggs produced.

$$\text{FCE (per dozen eggs)} = \frac{\text{g of feed consumed x 12}}{\text{Total eggs produced}}$$

Results and Discussion

Hen- Housed Egg Production (HHEP) and Hen-Day Egg Production (HDEP)

Figure 2 shows that the quails given with 10% of *Tahong* Meal (T_2) had the highest Hen- Housed Egg Production of 91.23% while the control groups (no TM) T_1 had the lowest with 59.50%. Analysis of Variance (ANOVA) revealed that the result was highly significant ($F= 18.6$; $P< 1\%$).

On the other hand, the Hen-Day Egg Production Fig. 3 shows that, with 10% of TM, T_2 had the highest HDEP of 91.23% which was attained with no mortality rate while the control group having 8.33% of mortality rate (no TM) T_1 had the lowest HDEP of 62.22%. After subjecting the treatment means to Analysis Of Variance (ANOVA), the result showed highly significant ($F= 15.33$; $P<1\%$).

The results indicate that the inclusion of TM *(Perna viridis)* to the ration of the laying quails at different level reported to have a positive impact on the HHEP and HDEP maybe because calcium (Ca) is very necessary for the formation of eggshell to form egg, as eggshell contains roughly 95% calcium carbonate and 5% organic materials (Halls, n.d.). But, too high concentration of calcium in the feeds can suppress egg production due to the excess of calcium (Keshavarz, 1986). Thus the birds in T_2 (10% TM) can take-in minimal amount of TM as a calcium source and can absorb an adequate amount of nutrients present in the commercial feeds to stimulate egg production.

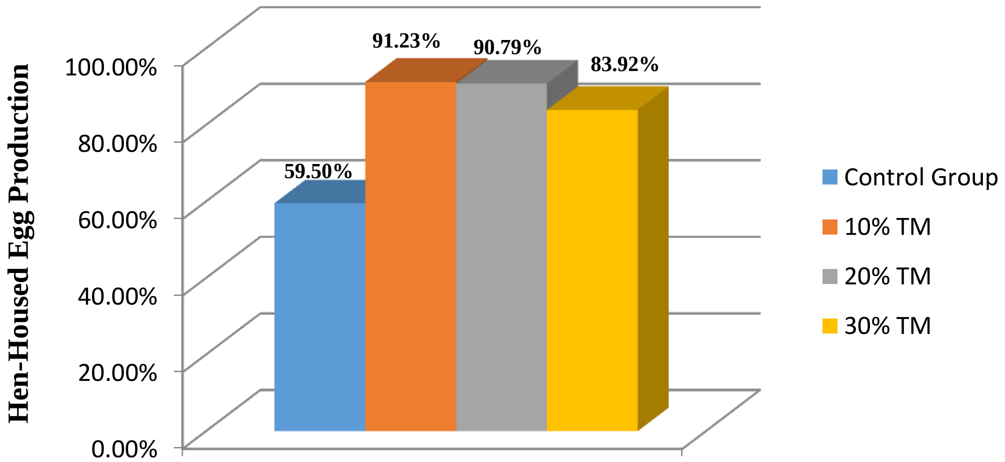

Figure 2. Hen-Housed Egg Production of quails as affected by different TM content.

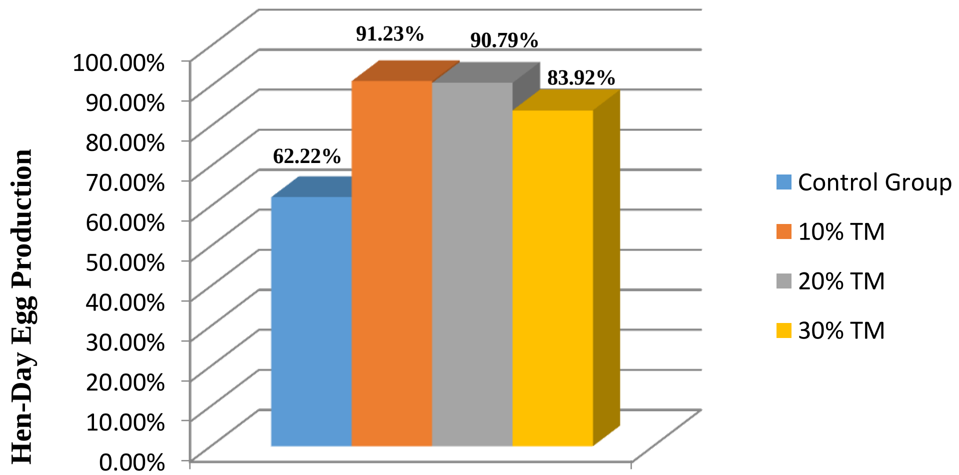

Figure 3. Hen-Day Egg Production of quails as affected by different TM content.

Egg Strength (ES) and Eggshell Weight (ESW)

The Egg Strength in Fig. 4 tells that, at the amount of 20% TM (T_3) gives the highest ES with 1,154.68gf/egg and the lowest was observed from the control group (T_1) with 798.17gf/egg. When the treatment means were subjected to Analysis Of Variance (ANOVA), the result shows the high significant difference (F= 27.95; P<1%).

The egg strength of the quail eggs indicates that when calcium source like TM is mixed to the ration of the laying quails at a different level, it enhances the strength of an egg thus providing the quail's calcium needs for the formation of a good eggshell. One major factor that affects the eggshell formation is the rate of calcium deposition on the eggshell during the egg formation process, (Koelkebeck, 1999). That is why those birds with TM in their ration exhibits harder shell compared with the control group. Arpasova, Halaj and Halaj (2010), said that calcium (Ca) in the shell, underlies its fragility and brittleness of the egg. However, when Calcium exceeds to the ideal level in the feeds as manifested by 30% TM, it shows lower egg strength compared to that of 10% TM and 20% TM. Both excess and deficiency of calcium will negatively affect the shell quality (Gupta, 2008; Halls, n.d).

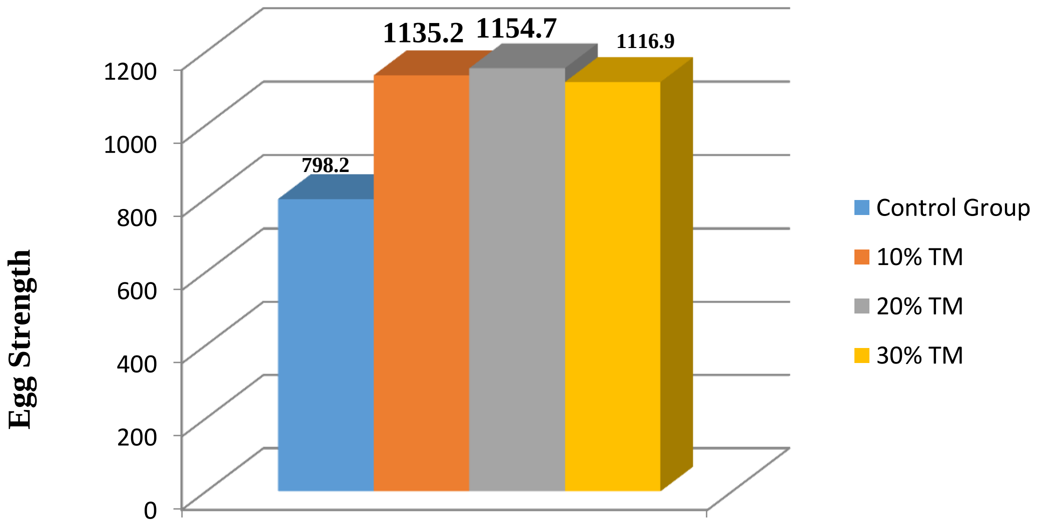

Figure 4. Egg Strength of quail eggs (gf) as affected by the different feeding ration.

Eggshell Weight (ESW)

Figure 5 shows that the amount of 20% TM (T_3) gives the highest Egg Shell Weight (ESW) of 0.924g/egg and the lowest was observed in the control group (T_1) with 0.768g/egg. Statistics shows that there was a significant difference among the treatments at 5 percent level (F=7.18).

Mixing Tahong Meal (TM) to the ration of laying quails at different levels significantly affected the eggshell weight of the treated quails due to the availability of calcium used for eggshell formation. The supplementation with calcium helps to increase eggshell quality (Koutoulis, 2009).

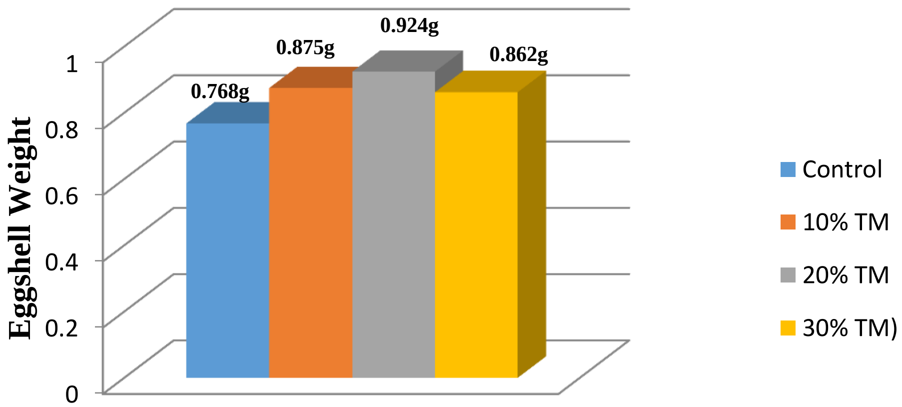

Figure 5. Eggshell Weight of quail eggs (g) as affected by the different feeding ration.

Daily Feed Intake (DFI)

The highest Daily Feed Intake per bird was observed from in control group (T_1) with 29.88g/bird/day and the lowest was observed in T_2 (10% TM) consuming 26.04g/bird/day. Analysis Of Variance (ANOVA) revealed no significant difference among the treatment means. The observed high feed consumption of the birds in T_1 might be attributed by its light yellow color in which birds prefer more to eat than the darker one.

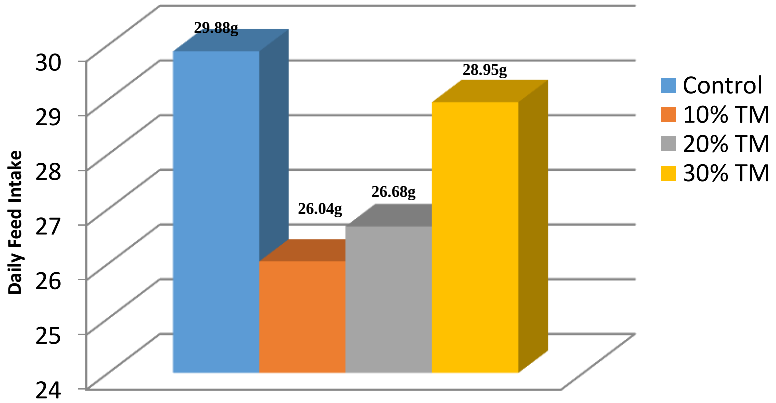

Figure 6. Daily Feed Intake of quail (g) as affected by the different feeding scheme.

Body Weight Gain (BWG)

Figure 7 indicates that the birds in T_1 or the control group had the highest Average Body Weight Gain of 16.08g/ bird, and lowest was observed in 20% TM having 1.54g/bird. After subjecting the treatment means to the Analysis of Variance (ANOVA), the result shows no significant difference among the treatment means.

The observed higher BWG of the birds in the control group can be attributed to its high feed consumption while low egg production thus the nutrients available in the feeds are converted into body muscles than converting it into egg products. The BWG in 20% TM which shows negative result from its initial weight (IW) may be due to its high egg production and relatively smaller feed consumption than the birds in 30% TM. The positive body weight gain in T_4 might have been governed by its higher feed consumption and relatively lower egg production. The bird converts available nutrients of the feeds into body tissues.

The birds in 10% TM exhibits a relatively higher BWG than the birds in 20% TM and 30% TM may be because the birds received an adequate amount of calcium needed to produce egg without compromising the absorption of other elements. While in treatments with 20% and 30% TM, too high calcium content in the feeds was found to have contributed negative effects on the birds body weight gain. This is explained by the study of (Sakas, 2002) who reported that high levels of calcium without the increased levels of manganese and zinc will interfere with the absorption of these trace elements.

Also as noticed that aside from calcium concentration in the diet, the feed intake of the birds can affect its BWG because even if the feed is having high calcium concentration but with higher bird's feed intake the BWG increased.

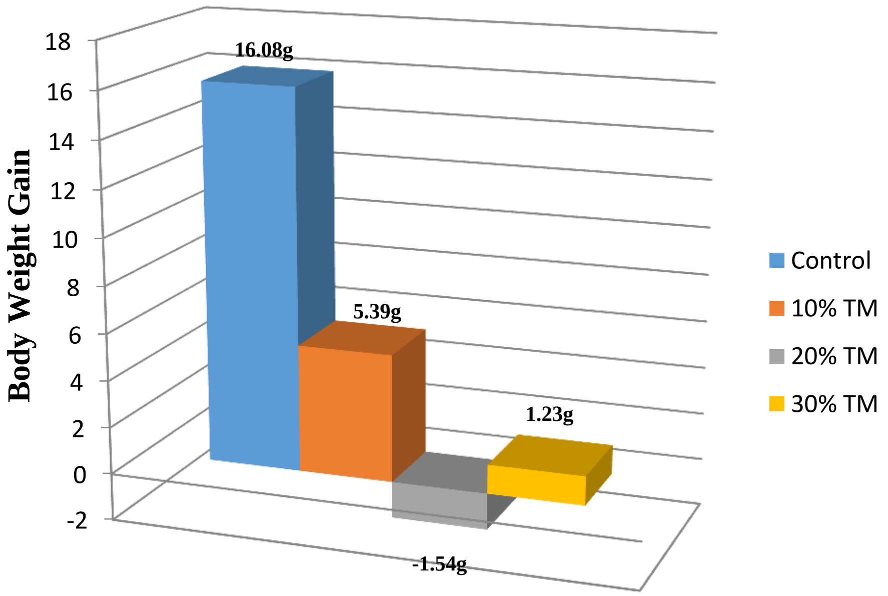

Figure 7. Body Weight Gain of quail (g) as affected by the different levels of Tahong Meal

Feed Conversion Efficiency (FCE)

In Figure 8, it is observed that the birds in the control group had the highest feed requirement to produce a dozen of eggs. It requires 608.15g/bird of feeds to satisfy its needs. The lowest feed consumers that can produce a dozen of eggs were the birds in 10% TM that require the only 344.88g of feed per bird. The treatment means were found statistically significant.

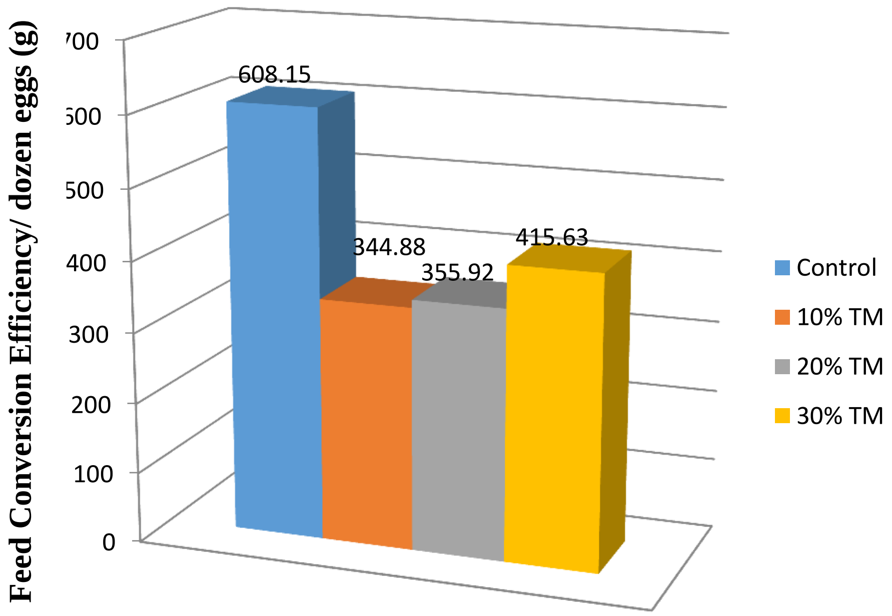

Figure 8. Feed Conversion Efficiency of Quail (per dozen eggs) as affected by the different level of *Tahong* Meal.

Conclusion

Mussel or Tahong *(Perna viridis)* meal supplies the daily calcium needs of the laying quails. However, the mussel or Tahong Meal is more effective at its optimal amount. The 20% mussel meal feed gives a maximum egg strength while a 10% results to a maximum egg production with high egg shell quality.

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