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Laying Performance of Quail *(Coturnix Coturnix)* Influenced By Different Levels of Oyster Shell

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ABSTRACT

The study was conducted to validate the potential of locally sourced oyster shells as a calcium supplement to quail egg production. The study was laid out in Randomized Complete Block Design (RCBD) with 5 treatments, replicated 3 times. The study was conducted at the Animal Village of ISUFST-SEC, San Enrique, Iloilo. Data gathered on egg production and egg quality were analyzed using the ANOVA in RCBD, while significant results were subjected to DMRT. The results revealed that birds fed 25 g of oyster shell produced the highest number of eggs and laying percentage, while 15–20 g of oyster shell resulted in heavier eggs across most weeks. Eggshell thickness was generally greater in groups fed with oystershell than in controls, with significant differences observed in selected weeks. Statistical analysis revealed that most parameters were not consistently significant across treatments, although notable improvements were observed at 15 g and 25 g. Economic analysis revealed that birds given 25 g of oystershell achieved the highest return on investment. These findings suggest that incorporation of oystershell in the diet can enhance laying performance, improve shell quality, and increase profitability in quail production, providing a viable alternative to synthetic calcium supplements.

Keywords: Oystershell powder, Japanese Quail, Egg Quality, egg Production

RATIONALE

Quail farming is considered a promising agricultural enterprise due to the species' rapid growth, early maturity, and high egg productivity, combined with relatively low investment requirements and quick financial returns (Pastore et al., 2012; Barros Júnior et al., 2020). Japanese quails (*Coturnix coturnix japonica*) are small, hardy, easy to manage, and efficient in feed utilization, making them highly suitable for both small- and large-scale production systems (Moraes et al., 2016; Weslane et al., 2017). They typically begin laying eggs at 6–7 weeks of age, and their eggs, which are relatively low in cholesterol, contribute to their value as a nutritious food source (Musa et al., 2008; Kaankuka et al., 2012). These characteristics highlight the potential of quail production as an emerging and sustainable poultry sector (Murakami & Ariki, 1998; Castro, 2014; Bagh et al., 2016; Sakamoto et al., 2018).

Despite these advantages, the sustainability and profitability of quail production largely depend on proper nutrition, particularly the adequate supply of essential minerals such as calcium. The increasing scarcity and high cost of conventional feed ingredients have become major constraints in poultry production, especially in developing countries (Anaeto & Adighibe, 2011; Apata & Babalola, 2012; Thirumalaisamy et al., 2016; Abdel-Hafeez et al., 2018). This situation has prompted the search for alternative, locally available feed resources that can meet the nutritional requirements of birds while reducing production costs (Agbabiaka et al., 2013; Abd El-Hack et al., 2015). Inadequate knowledge of nutrient requirements may further increase production costs due to under- or over-supplementation, thereby affecting the efficiency and profitability of poultry enterprises (Souza et al., 2017).

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Among essential minerals, calcium and phosphorus play a critical role in poultry nutrition. These minerals constitute approximately 80–85% of the skeletal structure and are also vital in eggshell formation and muscle function (McDowell, 1992). During the final stages of eggshell formation, calcium is mobilized from bone reserves, emphasizing the importance of adequate dietary calcium supply (Bain et al., 2016). Insufficient calcium intake has been associated with reduced egg production and poor eggshell quality, which can lead to significant economic losses.

Egg breakage remains a major issue in the poultry industry, with approximately 13–20% of total egg production lost before reaching consumers (Roland, 1988). Eggshell quality is closely linked to mineral nutrition, particularly calcium and phosphorus levels in the diet. Early studies have emphasized the importance of calcium source and particle size in improving eggshell quality. For instance, large particle sizes of oyster shell have been recognized as beneficial for laying hens (Collier, 1892). Several studies have reported that coarse oyster shell and ground limestone provide comparable results in eggshell strength (Waite, 1921; Buckner et al., 1923; Daugherty & Gossman, 1923; Alder, 1927; Miller & Bearse, 1935), while others have demonstrated the superiority of oyster shell in improving shell quality (Kennard, 1924; Stuart & Hart, 1938; Heuser & Norris, 1946; Quisenberry & Walker, 1970; Charles et al., 1971; Scott et al., 1971). Additionally, some reports have indicated that coarse oyster shell may enhance egg production compared with ground limestone (Hart et al., 1923; Halpin & Hayes, 1926; Hart et al., 1927).

Oyster shell and limestone are widely recognized as effective and economical calcium sources in poultry diets (McNaughton et al., 1974; Gerry, 1980; Roland, 1989). The optimal dietary calcium level for quail has been reported to range from 2.5% to 3.0% for maximum egg production and hatchability, while excessive levels may negatively affect performance (Singh & Panda, 1988). These findings highlight the importance of identifying appropriate calcium sources and inclusion levels to optimize production efficiency.

Given the rising cost of commercial feed ingredients and the need for sustainable production practices, the use of alternative calcium sources such as oyster shell presents a practical solution. However, limited information is available regarding its optimal inclusion level and effectiveness in quail diets under local production conditions.

Therefore, this study aims to evaluate the potential of oyster shell as an alternative calcium source in quail diets. Specifically, it seeks to determine its effects on egg production, egg quality, and economic returns. By identifying cost-effective feeding strategies, the study intends to support improved productivity and profitability in quail farming systems.

Objectives

Generally, the research focuses on the laying performance of quail. Specifically, the study aims to:

1. Determine the laying performance in terms of the number of eggs laid, the weight of eggs, and the laying percentage.

2. Determine the quality of egg shell in terms of egg shell thickness.

3. Determine if there is a significant difference in the laying performance of quail *(Coturnix coturnix)* supplemented with the different levels of oyster shell; and

4. Compute the Return on Investment (ROI) of the Laying Performance of quail *(Coturnix coturnix)* influenced by different levels of oyster shell.

Scope And Limitation Of The Study

The study was conducted to validate the potential of locally sourced oystershell as a calcium supplement to quail egg production. The study was laid out in a Randomized Complete Block Design (RCBD) with 5

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treatments, replicated 3 times. The study was conducted at the Animal Village of ISUFST-SEC, San Enrique, Iloilo, with a duration of two (6) months.

Significance Of The Study

The research study aims to aid the Local and National Governments and the Academe in using oyster shell as a feed supplement. Oystershell as a calcium supplement can help the local farmers explore an alternative source of calcium and minimize the cost for mineral supplementation. Oystershells as a calcium supplement create opportunities for livelihood and income for the local poultry raisers.

METHODOLOGY

Data on the egg production and egg quality were gathered during the experimentation. It was analyzed using the ANOVA in RCBD, while significant results were subjected to DMRT.

The pulverized oyster shell was prepared by gathering used Oyster shells from wet markets and restaurants in the morning and afternoon and placing them in a clean container. The Oyster shells were washed thoroughly and dried in the sunlight. After drying, the cleaned Oyster shell was pounded using a hammer and placed in a clean container, ready for use.

RESULT AND DISCUSSION

Number of Eggs. The results on egg production are presented in Table 1. Quails supplemented with 25 g of oyster shell generally recorded higher egg production in weeks 1, 3, 6, and 8 compared with birds receiving lower supplementation levels. However, in several weeks, the control groups produced comparable or higher egg numbers than the supplemented groups.

Statistical analysis showed no significant differences among treatments during weeks 1–2 and 4–8, except in week 3. In this week, birds supplemented with 15 g and 25 g of oyster shell produced significantly more eggs; however, these values were statistically comparable with those of the control groups. These findings indicate that oyster shell supplementation does not consistently improve egg production across the experimental period, although occasional numerical increases were observed.

The inconsistent response may be attributed to the multifactorial nature of egg production, particularly nutrient balance. Calcium plays a critical role in egg production, and deficiencies lead to reduced laying performance (Singh & Panda, 1988). Previous studies have reported that coarse calcium sources, such as oyster shell, can improve egg production (Hart et al., 1923; Kennard, 1924), although such improvements are not always consistently expressed, as observed in the present study.

Egg Weight (g). Egg weight data are summarized in Table 1. Birds supplemented with 15–20 g of oyster shell tended to produce heavier eggs during weeks 1–3 and 6–8, whereas birds receiving calcium premix produced the heaviest eggs during weeks 4 and 5.

However, analysis of variance revealed no significant differences among treatments throughout the experimental period. This finding indicates that oyster shell supplementation results in egg weights comparable to those obtained using synthetic calcium sources, but does not significantly improve this parameter.

These results support previous findings that different calcium sources can produce similar outcomes when dietary requirements are met (McNaughton et al., 1974; Roland, 1989).

Eggshell Thickness (mm). Eggshell thickness results are presented in Table 1. Birds supplemented with oyster shell showed numerically thicker shells during weeks 1, 4–5, and 7, whereas the control groups produced thicker shells in weeks 2, 3, 6, and 8.

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Statistical analysis revealed no significant differences among treatments in weeks 1 and 3–7. Significant differences were observed in weeks 2 and 8; however, oyster shell treatments were comparable with the control and differed only from the synthetic supplement group. These findings suggest that oyster shell can maintain eggshell thickness at levels comparable to conventional calcium sources

Laying Percentage (%). As presented in Table 1, birds supplemented with 25 g of oyster shell exhibited the highest numerical laying percentage, followed by those receiving 15 g. Statistical analysis revealed significant differences among treatments, indicating that supplementation may improve laying efficiency.

This observation is consistent with the established role of calcium in reproductive performance, particularly in egg formation. Adequate calcium intake supports sustained laying activity in high-producing birds (McDowell, 1992).

Return on Investment (ROI). Economic evaluation (Table 2) showed that quails supplemented with 25 g of oyster shell achieved the highest return on investment, followed by the control group. ROI increased by up to 28.42% compared with other treatments.

This finding suggests that oyster shell supplementation may provide economic benefits even when biological responses are not consistently significant. This result is particularly relevant in the context of rising feed costs and limited availability of conventional feed ingredients, which remain major constraints in poultry production (Anaeto & Adighibe, 2011; Abdel-Hafeez et al., 2018). The use of alternative, locally available resources such as oyster shell can help reduce production costs while maintaining acceptable performance levels.

CONCLUSION

Based on the discussion and interpretation of the data, the researchers concluded that:

1. Oyster shell supplementation resulted in numerical improvements in egg production and laying percentage, particularly at the 25 g level; however, most differences were not statistically significant across production weeks.

2. Egg weight and eggshell thickness were generally comparable among treatments, indicating that oyster shell performs similarly to conventional calcium sources but does not consistently provide significant advantages.

3. Significant effects were observed only in specific weeks and parameters, suggesting that responses to supplementation vary over time.

4. Economic analysis revealed that 25 g oyster shell supplementation yielded the highest return on investment, highlighting its potential as a cost-efficient feed component.

RECOMMENDATIONS

Based on the conclusion, the following recommendations are forwarded:

1. Oyster shell may be used as an alternative calcium source in quail diets, as it produces performance comparable to synthetic supplements under the conditions of this study.

2. Specific supplementation levels (25 g) should be recommended with caution, as most production parameters did not show consistent statistical improvement.

3. Future studies should include larger sample sizes, longer feeding periods, and more detailed experimental designs to validate the observed trends.

4. Further research should investigate different oyster shell particle sizes and their interaction with other dietary components to optimize utilization in quail production systems.

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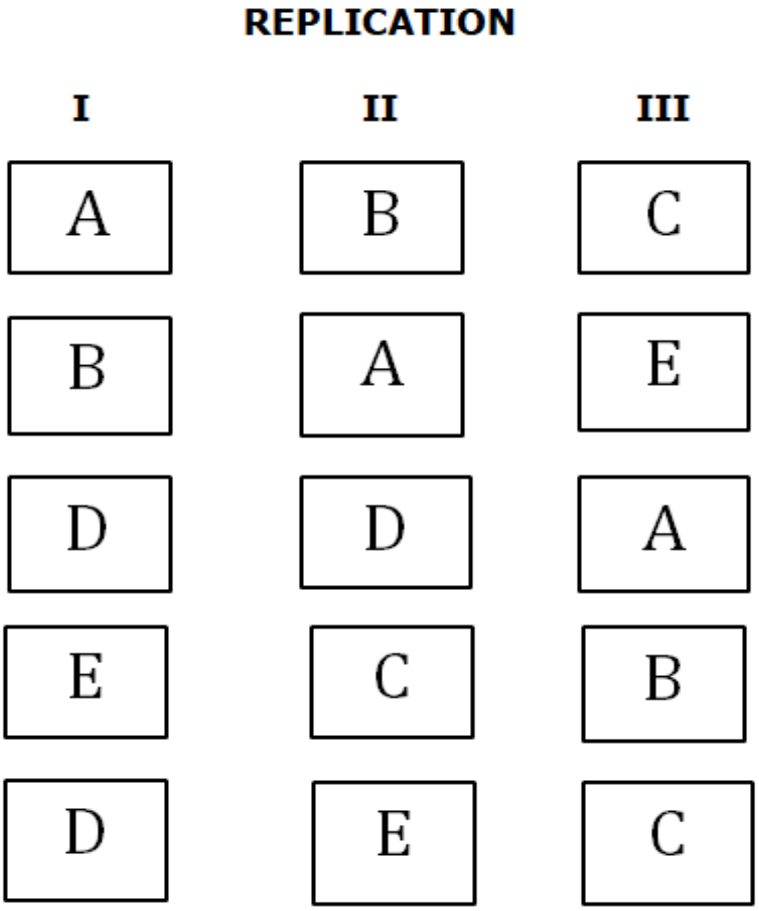

Figure 1. Experimental lay-out of the study

Legend:

Treatment A - Control 1 (No supplementation)
B – 15 grams of Oystershell + 985 grams commercial feeds
C – 20 grams of Oystershell + 980 grams commercial feeds
D – 25 grams of Oystershell + 975 grams commercial feeds
E - Control 2 (Synthetic supplementation)

Summary Table. Laying performance of quail influence by different levels of oyster shell

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PARAMETERS	TREATMENTS					LEVEL OF Sig.	CV%
	A	B	C	D	E		
Number of Eggs (g)							
Week 1	5.50	5.17	4.00	5.92	5.00	ns	16.06
Week 2	6.50	6.08	5.50	6.17	5.75	ns	19.66
Week 3	6.08[a]	5.67[a]	4.58[b]	6.33[a]	6.08[a]	*	9.74
Week 4	6.08	5.42	5.75	5.75	5.33	ns	12.96
Week 5	6.08	5.58	5.33	6.08	6.50	ns	11.23
Week 6	5.25	5.42	5.42	5.67	5.33	ns	17.31
Week 7	6.25	6.67	6.17	5.75	6.17	ns	16.08
Week 8	5.25	5.42	5.42	5.67	5.33	ns	17.31
Weight of Eggs							
Week 1	10.74	11.07	11.27	10.73	10.76	ns	5.58
Week 2	11.15	11.33	11.45	10.81	11.23	ns	6.63
Week 3	10.96	11.51	11.16	10.35	11.22	ns	5.94
Week 4	10.71	11.03	10.69	10.28	11.10	ns	6.44
Week 5	10.61	11.33	11.11	10.63	11.34	ns	6.09
Week 6	10.52	11.11	10.49	10.04	9.32	ns	36.58
Week 7	10.63	10.72	10.42	9.60	10.46	ns	5.64
Week 8	10.64	10.61	10.54	9.57	10.42	ns	4.59
Eggshell Thickness							
Week 1	0.28	0.30	0.37	0.23	0.22	ns	36.50
Week 2	0.30[a]	0.29[a]	0.23[b]	0.28[a]	0.25[b]	ns	10.64
Week 3	0.26	0.24	0.21	0.24	0.24	*	15.66
Week 4	0.20	0.23	0.20	0.22	0.21	ns	13.53
Week 5	0.36	0.41	0.40	0.48	0.47	ns	16.79
Week 6	0.32	0.28	0.28	0.28	0.36	ns	16.30
Week 7	0.31	0.40	0.37	0.32	0.34	ns	11.17
Week 8	0.39[a]	0.31[bc]	0.32[bc]	0.29[c]	0.36[ab]	**	7.37
Laying Percentage							
	84	81	75	85	81	ns	4.3

abc - Means with the same letter superscript are not significantly different
ns – not significant at 5% level
* - significant at 5% level
** - significant 1% level

Table 2. Return on investment of Quail as influenced by Oystershell

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ITEMS	TREATMENTS				
	A	**B**	**C**	**D**	**E**
[1]Sales of Eggs (Php)	93.98	90.86	84.34	94.68	90.98
[2]Stocks	25.00	25.00	25.00	25.00	25.00
[3]Housing	1.38	1.38	1.38	1.38	1.38
[4]Feeds	40.32	40.32	40.32	40.32	40.32
[5]Oystershell	0	0.17	0.34	0.50	0
[6]Synthetic supplement	0	0	0	0	5.00
[7]Labor	6.5	6.5	6.5	6.5	6.5
[8]Electricity	0.02	0.02	0.02	0.02	0.02
Total Expenses	73.22	73.388	73.556	73.72	78.22
Net Profit	20.76	17.47	10.78	20.96	12.76
ROI	**28.35**	**23.81**	**14.66**	**28.42**	**16.31**