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EGG QUALITY AND CHICK SURVIVABILITY OF PHENOTYPICALLY CHARACTERIZED PHILIPPINE NATIVE CHICKENS AS AFFECTED BY STORAGE DURATION AND SHAPE INDEX

[1*]Triel Martin Felix and [2]Mary Arnel D. Garcia

[1]Department of Agricultural Sciences, Mariano Marcos State University, Batac City, Ilocos Norte, 2900, Philippines.

[2]Department of Animal Science, Benguet State University, La Trinidad, Benguet, 2601, Philippines.

*Corresponding Author

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ABSTRACT

The study evaluated the effect of storage duration and shape index on the quality of eggs and survivability of chicks from phenotypically characterized Philippine native chickens. A total of 135 eggs were collected and classified based on shape index (SI): sharp (SI < 72), normal (SI = 72–76), and round (SI > 76). Eggs were subjected to three storage durations: 0, 5, and 10 days at a constant temperature of 18°C. The study was laid out in split-plot design with three replications. Results showed that weight loss significantly increased with longer storage duration. The internal quality parameters such as yolk height, albumen height, yolk and albumen weight and Haugh unit were significantly affected by storage duration and shape index while yolk color remains unaffected. Shape index alone influenced initial egg weight and yolk height.

Keywords: storage duration, shape index, egg quality, Philippine native chicken

INTRODUCTION

Native chickens are typically raised in the backyards of rural households and are commonly grown in small numbers of up to about 24 hens for meat and egg production as an additional source of income (Santiago[45], 2018). Over the years, much emphasis has been given on native chicken production. However, there were only few researches which dealt on native chicken eggs. Among these include the studies of dela Cruz *et al.*[12] (2020), Lambio[35] (2000) and Rasali *et al.*[43] (1993). It is imperative to note that native chicken eggs are a source of income of farmers, as these are sold for table consumption, or subjected to artificial incubation and allowed to hatch to produce viable chicks that fetch a higher price compared to table eggs. Farmers often wait for a few days prior to

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incubation to maximize the capacity of the incubator and as such egg storage is required. The goal of egg storage is to stop the embryo's growth until incubation begins (Narushin and Romanov[40], 2002). However, an increase in the storage duration decreases hatchability (Ayeni *et al*.[9] 2020; Bell[10], 1996), which has a significant impact on the survivability and availability of day-old chicks (Alasahan and Copur[3], 2016). Aside from storage, egg shape index (SI) affects egg quality (Ukwu *et al*.,[56] 2017; Duman *et al*.,[13] 2016) and consequently the hatchability and weight of hatched chicks (Ayeni *et al*.[9] 2020; King'ori[33], 2011; Narushin and Romanov[40], 2002). Egg shape index is defined as the width-to-length ratio of the egg. Based on SI, eggs can be sharp (SI<72), normal (SI = 72-76), or round (SI>76) as described by Duman *et al*.[13] (2016). Hence, differences in shape could mean variation in the quality traits of native chicken eggs as well as the fertility, hatchability, and weight of hatched chicks.

Despite the numerous literatures discussing the effect of storage duration and shape index, these were conducted in other countries. Studies focusing specifically on Philippine native chicken eggs have not yet been fully explored. Thus, to address this lack of information, this study was conducted. As of date, there were a number of researches on the quality, fertility, and hatchability of chicken eggs as well as the weight of newly hatched chicks and their survivability after brooding such as those conducted independently by Ayeni *et al*.[9] (2020), Khalil *et al*.[30] (2016), Aşci and Durmuş[7] (2015), Narushin and Romanov[40] (2002), and Farooq *et al*.[16] (2001). However, these were conducted in other countries, and thus, studies focusing specifically on Philippine native chicken eggs have not yet been fully explored. Thus, the findings of the study are a helpful tool for researchers especially those focusing on the evaluation of native chicken egg quality traits, both looking at the internal and external attributes, hatchability, and fertility rate of native chicken eggs as well as the weight of the newly hatched chicks and their survivability at brooding. This added to the body of knowledge especially on the influence of the interaction of the two factors, storage duration and shape index, on the said parameters. Apart from being an important tool for researchers, farmers can use the result of this study as a guide in egg storage and incubation. This will help farmers decide how long native chicken eggs should be stored and what shape should not be stored for long so that quality will not deteriorate especially if the eggs are planned to be incubated. This would result to increased hatchability of the eggs that can result to an increased profit for the farmers.

MATERIALS AND METHODS

The experiment was laid out in Split-Plot Design with storage duration and shape index as main plot and subplot factors, respectively. Levels for storage duration were no storage, 5 days and 10 days, while shape index was sharp, normal, and round. The experiment was replicated thrice. Thus, there was a total of nine treatment combinations.

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The study was divided into three sub-study each of which has specific materials and methods that was followed. The eggs used in this study were collected from Philippine native chickens aged 8 to 12 months, representing birds in their peak reproductive stage. The breeder flock was maintained under a semi-scavenging production system, wherein birds primarily consumed locally available feed resources such as corn and rice, supplemented with commercial feeds to ensure adequate nutrient intake. All breeder chickens were observed to be clinically healthy, with no visible signs of disease at the time of egg collection. A mating ratio of one rooster to ten hens (1:10) was maintained to ensure optimal fertility and egg production.

Study 1: Egg Quality as Affected by Storage Duration and Shape Index

A total of 135 eggs were purchased from native chicken raisers. A digital Vernier caliper was used in measuring the yolk and albumen height. It was also used in sorting the egg based on the shape index. The DSM YolkFanTM was used to ensure the correct measurement for the yolk color of the eggs. A digital weighing scale with a capacity of 500 g and a graduation of 0.1 g was used in weighing the whole eggs, egg albumen and egg yolk. A window type air conditioner with 0.8 hp was installed in the storage room to maintain a constant temperature of 18°C

The eggs were collected 5-10 hours after being laid from a native chicken farm and this was sorted based on the shape index which was recorded by measuring the length (mm) and width (mm) of the egg using a digital Vernier caliper. Eggs were classified as sharp (SI<72), normal (72<SI<76), or round (SI>76). SI was calculated using the equation suggested by Duman *et al.*[13] (2016) as follows:

$$SI=\frac{\text{Egg width}}{\text{Egg length}} \times 100$$

The 5th and 10th day storage periods were followed based on the study of Samli *et al.*[44] (2005). There were three groups, such that each group consists of all the egg shape indices. The first group of eggs was stored for five days, while the second group was stored for ten days. The third group was not stored, instead, the quality of the egg was measured immediately upon collection which served as a baseline in comparison to the quality of the eggs stored for five and ten days. The eggs were stored in egg trays at a temperature of 18°C.

The external quality of egg that were gathered include initial weight, weight after storage, and weight loss. The initial weight of egg was recorded as the weight (g) of each egg taken immediately after collection using a digital weighing scale. Also, the weight (g) of the egg was recorded at the end of the 5- and 10-day storage periods to compute the egg weight loss (%).

Measurements of the internal quality was obtained by carefully making an opening around the sharp end of the egg, large enough to allow passage of both the albumen and the yolk through it

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without mixing their contents together. The internal egg quality parameters measured include the yolk color, yolk and albumen height, yolk and albumen weight, and Haugh Unit.

Study 2: Hatchability and Fertility of Eggs as Affected by Storage Duration and Shape Index

A 100-egg capacity, fully automatic incubator was used in the study and a candling box was used to determine the fertility of the eggs during the artificial incubation.

The eggs were incubated in a 100-capacity fully automatic incubator for 21 days. The temperature in the incubator was maintained at 37.5 to 38°C. Candling was done on the 14th day of incubation to determine the number of fertile eggs. The eggs were illuminated at the blunt side using a candling box.

The fertility rate was calculated by dividing the number of fertile eggs with the total number of eggs incubated multiplied by 100.

$$\text{Fertility rate} = \frac{\text{No. of fertile eggs}}{\text{No. of eggs incubated}} \times 100$$

The hatchability rate was calculated based on the number of eggs set (commercial hatchability rate) and the number of fertile eggs after candling that hatched (scientific hatchability rate).

$$\text{Commercial hatchability rate (\%)} = \frac{\text{No. of hatched eggs}}{\text{No. of eggs set}} \times 100$$

$$\text{Scientific hatchability rate (\%)} = \frac{\text{No. of hatched eggs}}{\text{No. of fertile eggs}} \times 100$$

Study 3: Weight of Hatched Chicks and Survivability After Brooding as Affected by Storage Duration and Shape Index

A digital weighing scale that could measure 0.01 to 500 g was used in weighing the hatched chicks. Brooding cages was constructed from steel frame, wood and chicken wire. Incandescent bulbs were installed in the brooder cages as a source of heat.

The brooding period lasted for 21 days. The recommended temperature and space allowance in the brooder cage was maintained following the recommendations of DOST-PCAARRD[52] (2004). Chick booster crumble and broiler starter crumble were given *ad libitum* from 1-14 days and from 15-21 days, respectively. Shifting of feeds was done gradually by mixing the broiler starter crumble with the chick booster mash starting on the 12th day of feeding (DOST-PCAARRD[52], 2004). Adequate amount of water was given to the chicks.

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A digital weighing scale was used to accurately record chick weight. The average weight (g) of the chicks per replicate were obtained after hatching and was noted as initial weight. Also, the average weekly weight (g) of the chicks per replicate were recorded. Meanwhile, the final weight was obtained as the average weight (g) of the chicks per replicate after the brooding period.

Statistical Analysis

Homogeneity of treatment variances and normality of errors was checked using Bartlett's test and Wilk Shapiro test, respectively. After satisfying these assumptions, the effects of storage duration and shape index were determined using Analysis of Variance (ANOVA). When the effect of the interaction of storage duration and shape index was significant, treatment mean comparison was done using Tukey's Honest Significant Difference (HSD) test. Meanwhile, when the effect of either factor was significant, treatment means were compared using Least Significant Difference (LSD) test. These were done at 5% level of significance and letter groupings were generated. The analysis was conducted using the Statistical Tool for Agricultural Research (STAR 2.0.1) software.

RESULTS

External Egg Quality

Initial weight: Analysis of variance showed that the interaction effect between storage duration and shape index did not significantly affect egg weight. Only shape index significantly influenced ($p < 0.01$) egg weight (Table 1). Normal and round eggs had comparable weights (43.32–43.39 g) and were heavier than sharp eggs (42.30 g).

Weight after storage: Egg weight after storage, considered as the final weight, was not affected ($p > 0.05$) by the interaction between the two factors. However, similar to the trend observed prior to storage, final weights significantly differed among shape indices. Table 1 shows that, regardless of storage duration, normal and round eggs, which had statistically comparable final weights, remained heavier than sharp eggs.

Weight loss: Analysis of variance indicated that the interaction between storage duration and shape index significantly ($p < 0.01$) influenced egg weight loss (Table 1). Egg weight loss increased with longer storage duration. Specifically, the highest weight loss (0.68–1.32%) was observed in eggs stored for 10 days, followed by those stored for five days (0.47–0.68%).

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Table 1: Mean Initial Weight (IW), Final Weight (FW) and Weight Loss (WL) of Eggs as Affected by Storage Duration and Shape Index

TREATMENT	IW (g)	FW (g)	WL (%)
Storage Duration (days)			
0	42.80	42.80	0.00
5	43.25	42.98	0.61
10	42.96	42.53	1.00
Shape Index			
Sharp	42.30 [b]	42.11 [b]	0.43
Normal	43.39 [a]	43.17 [a]	0.51
Round	43.32 [a]	43.03 [a]	0.67
F-test			
Storage Duration (D)	ns	ns	**
Shape Index (I)	*	*	**
D x I	ns	ns	**
CV a (%)	2.51	2.54	14.05
b	1.19	1.20	12.32

** - significant at 1% level; * - *significant at 5% level; ns – not significant; CV – Coefficient of Variation*

Internal Egg Quality

Yolk color: Egg shape index (SI) and storage duration did not significantly influence yolk color. All eggs used in the study had a yolk color rating of 11 based on the yolk color fan.

Yolk height: Analysis of variance showed that the interaction between storage duration and shape index was not significant ($p > 0.05$). Only shape index significantly influenced ($p < 0.01$) yolk height. The findings revealed that yolk height differed among shape indices (Table 2).

Albumen height: Analysis of variance showed that the interaction between storage duration and shape index had a significant ($p < 0.01$) effect on albumen height (Table 5). In general, albumen height decreased with increasing storage duration. Prior to storage, eggs—regardless of shape index—had similar ($p > 0.05$) albumen heights, ranging from 8.48 to 9.02 mm. With prolonged storage, the albumen height of sharp eggs decreased more rapidly. In contrast, the albumen height of normal and round eggs did not decrease after five days of storage, with significant reductions observed only after 10 days.

Yolk and albumen weight: The interaction between storage duration and shape index did not significantly affect yolk and albumen weight. However, highly significant ($p < 0.01$) differences

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were observed among shape indices. Sharp eggs had significantly lower yolk and albumen weights compared to normal and round eggs, which ranged from 36.71 to 37.42 g (Table 2). The values for normal and round eggs were statistically comparable.

Haugh unit: The Haugh unit (HU) was significantly influenced by the interaction between storage duration and shape index (Table 2). A reduction in HU for sharp and normal eggs was observed after five days of storage. In contrast, round eggs maintained comparable HU values up to five days, with a decline observed only after 10 days of storage.

Table 2: Mean Yolk Height (YH), Albumen Height (AH), Yolk-Albumen Weight (YAW) and Haugh Unit (HU) of Eggs as Influenced by Storage Duration and Shape Index

TREATMENT	YH (mm)	AH (mm)	YAW (g)	HU
Storage Duration (days)				
0	16.75	8.79	36.95	97.88
5	16.28	8.03	36.77	95.20
10	15.90	7.93	35.90	93.83
Shape Index				
Sharp	15.58 [b]	8.37	35.49 [b]	96.04
Normal	16.81 [a]	8.19	37.42 [a]	95.88
Round	16.54 [a]	8.20	36.71 [a]	94.99
F-test				
Storage Duration (D)	ns	**	ns	**
Shape Index (I)	**	*	*	*
D x I	ns	**	ns	*
CV a (%)	4.24	3.37	4.06	2.51
b	3.45	1.61	2.67	1.19

** - significant at 1% level; * - *significant at 5% level; CV – Coefficient of Variation*

Fertility Rate

The results indicated that neither storage duration nor egg shape index significantly influenced the fertility rate of Philippine native chicken eggs (Table 3).

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Table 3: Mean Fertility Rate of Eggs as Influenced by Storage Duration and Shape Index

TREATMENT	FERTILITY RATE (%)
Storage Duration (days)	
5	60.00
10	60.00
Shape Index	
Sharp	78.34
Normal	50.00
Round	51.67
F-test	
Storage Duration (D)	ns
Shape Index (I)	ns
D x I	ns
CV a (%)	8.51
b	9.27

ns - not significant; CV - Coefficient of Variation

Hatchability Rate

The interaction effect of storage duration and shape index on hatchability rate, whether expressed as commercial or scientific hatchability, was not significant ($p > 0.05$). Analysis of variance revealed that only storage duration significantly ($p < 0.05$) influenced both commercial and scientific hatchability rates, as shown in Table 4. Regardless of shape index, both hatchability parameters decreased with increasing storage duration, from 65.56% at five days of storage to 46.67% at ten days.

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Table 4: Mean Commercial and Scientific Hatchability Rates (%) of Eggs as Influenced by Storage Duration and Shape Index

TREATMENT	HATCHABILITY RATE (%)	
	Commercial	Scientific
Storage Duration (days)		
5	43.33 [a]	83.29 [a]
10	28.89 [b]	59.94 [b]
Shape Index		
Sharp	35.00	68.49
Normal	41.67	80.89
Round	31.67	65.48
F-test		
Storage Duration (D)	*	**
Shape Index (I)	ns	ns
D x I	ns	ns
CV a (%)	6.80	13.54
b	15.15	13.98

** - significant at 1% level; * - significant at 5% level; ns - not significant; CV - Coefficient of Variation

Initial Weight of Chicks

Analysis of variance showed that only egg shape index significantly ($p < 0.05$) affected the initial weight of chicks (Table 5). The initial weights of chicks from sharp and normal eggs were comparable, ranging from 27.62 to 27.67 g. Chicks hatched from round eggs had the highest initial weight (28.10 g), which was significantly higher ($p < 0.05$) than those from sharp and normal eggs.

Weekly Weight

Following the trend observed in initial weight, analysis of variance similarly showed that only egg shape index significantly affected chick weight during the first and second weeks (Table 5). In the first week, the weights of chicks from sharp and normal eggs were not significantly different, whereas chicks hatched from round eggs were significantly heavier. By the second week, chick weights became comparable (61.78–62.98 g), which may be attributed to uniform environmental and management conditions during brooding.

In the third week, chick weight was independently affected by both shape index ($p < 0.01$) and storage duration ($p < 0.05$). As presented in Table 5, chicks hatched from larger eggs (i.e., normal

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and round) had comparable weights and were heavier (129.27–129.98 g) than chicks from sharp eggs.

Table 5: Initial and Weekly Weight (g) of Chicks as Influenced by Egg Storage Duration and Shape Index

TREATMENT	WEIGHT OF CHICKS (g)			
	Initial	Week 1	Week 2	Week 3
Storage Duration (days)				
5	27.80	42.77	62.07	129.74 [a]
10	27.79	42.61	62.63	129.04 [b]
Shape Index				
Sharp	27.67 [b]	42.42 [b]	61.79	128.94 [b]
Normal	27.62 [b]	42.55 [b]	62.29	129.27 [a]
Round	28.10 [a]	43.10 [a]	62.98	129.98 [a]
F-test				
Storage Duration (D)	ns	ns	ns	*
Shape Index (I)	*	*	ns	**
D x I	ns	ns	ns	ns
CV a (%)	1.21	1.14	1.11	0.16
b	1.07	0.81	1.17	0.45

** - significant at 1% level
* - significant at 5% level
ns - not significant

Survivability Rate

Throughout the duration of the study, no mortality was recorded among chicks across all treatments, indicating 100% survivability from hatching until the end of the brooding period. This outcome may be attributed to the uniform management practices applied to all chicks.

DISCUSSIONS

External Egg Quality

Initial weight: The findings of the study are consistent with the results of previous studies (Duman *et al.*[13] 2016; Alkan[5] *et al.* 2013) which reported that egg weight varies with shape index. This variation may be attributed to the distribution of egg components, particularly the albumen, which

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constitutes the denser portion of the egg and occupies a greater width in certain egg shapes, thereby contributing to increased weight. In contrast, the findings of Khan *et al*.[29] (2013) and Melo *et al*.[38] (2021) indicated that egg weight does not significantly differ among eggs of varying shapes.

Weight after storage: The study showed that, regardless of storage duration, normal and round eggs remained heavier than sharp eggs, consistent with the findings of Duman et al.[13] (2016), Alkan *et al.*[4] (2014), and Venkatesh *et al.*[57] (2019). The positive correlation between shape index and egg weight reported by Venkatesh et al. (2019) may be attributed to the wider structure of certain eggs, which allows for greater albumen content and, consequently, increased mass. In contrast, other studies, such as those of Melo *et al*.[38] (2021), reported significant reductions in egg weight during prolonged storage, primarily due to moisture and gas loss, as well as the transfer of moisture from the albumen to the yolk.

Weight loss: Weight loss can be attributed to the loss of moisture and gases from the egg contents through the shell by evaporation. As storage progresses, eggs begin to deteriorate due to the diffusion of water vapor and CO_2 (Jinangrat *et al*.[27] 2010), leading to weight loss and a decline in egg quality. Although the shell functions as a protective barrier against pathogen entry, it is not completely impermeable; thus, the shell and its membranes allow the gradual loss of moisture from the albumen (Hassan and Aylin[22], 2009). Since shape index influenced egg weight both before and after storage, weight loss was consequently associated with the initial weight of the eggs. Heavier eggs tended to be rounder, while lighter eggs were generally sharper in shape. Accordingly, the results of the study showed that round eggs (heavier) exhibited the highest weight loss (0.67%), followed by normal (0.51%) and sharp eggs (0.43%). This finding is consistent with the results of Alabi[2] *et al.* (2012), who reported that heavier eggs tend to lose more weight than lighter ones.

Internal Egg Quality

Yolk color: Consistent with the findings of Duman *et al.*[13] (2016), yolk color was not affected by shape index, and no significant correlation between shape index (SI) and yolk color was observed. Storage duration also had no significant effect, in agreement with Kralik *et al.*[34] (2014), who reported no meaningful change in yolk color even after 28 days of storage. In contrast, Jin *et al.*[26] (2011) observed a decrease in yolk color with prolonged storage; however, this difference may be attributed to the higher storage temperatures used in their study, unlike the controlled 18 °C condition maintained in the present experiment.

Yolk height: Yolk height was higher in sharp and round eggs than in normal eggs. This finding contrasts with the results of Duman *et al.*[13] (2016), who reported no significant effect of shape index on yolk height. While Eke *et al.*[14] (2013) observed a decrease in yolk index with prolonged storage, the constant storage temperature used in the present study may have slowed the rate of deterioration. As storage progresses, the albumen becomes more fluid, allowing water to migrate

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into the yolk (Stadelman & Cotteril[49], 2007). This results in yolk swelling and a subsequent reduction in yolk height (Watkins[58], 2007).

Albumen height: Albumen height decreased with increasing storage duration, supporting the findings of Jin *et al.*[26] (2011) and Feddern *et al.*[18] (2017). This reduction may be attributed to the liquefaction of the thick albumen and the increase in pH resulting from the breakdown of carbonic acid into CO_2 and water. These changes weaken the protein structure of the albumen, leading to a decline in albumen height.

Yolk and albumen weight: The heavier weight of normal and round eggs likely explains their higher yolk and albumen weights, as egg components generally increase with overall egg mass, consistent with the findings of Alkan *et al.*[4] (2014), Khawaja *et al.*[31] (2013), and Tebesi *et al.*[51] (2012). Storage duration did not significantly affect yolk and albumen weight in this study, which contrasts with the findings of Silversides and Scott[47] (2000) who reported increases during prolonged storage. Such increases have been attributed to rising internal temperature, which accelerates the breakdown of albumen proteins and the vitelline membrane (Jones *et al.*[28] 2018). This process facilitates the transfer of moisture from the albumen to the yolk (Jin *et al.*[26] 2011) and reduces albumen viscosity (Kumbár *et al.*[36] 2015). In contrast, the controlled storage temperature of 18 °C used in the present study may have minimized these changes.

Haugh unit: The Haugh unit (HU) is widely accepted as the "gold standard" for assessing internal egg quality and freshness. It is considered an objective measure of egg freshness and closely reflects consumer preferences; thus, higher HU values indicate better egg quality (SMS[48], 2022). The results of the present study agree with the findings of Gavril and Ustoroi[19] (2012), Tona *et al.*[53] (2004), and Jin *et al.*[26] (2011) which showed that increasing storage duration leads to a decrease in the Haugh unit of eggs.

Fertility Rate

Fertility rate, as discussed by Deeming and Wadland[11] (2002), is influenced by several factors, including the rooster-to-hen ratio. Notably, fertility tends to be higher at a mating ratio of 8:1 compared to 12:1. The age of the hen also affects fertility, as reproductive performance generally declines with advancing age. Meijerhof *et al.*[37] (1994) suggested that this reduction may be due to a decreased ability of hens to store spermatozoa, as well as a decline in follicular quality. In addition, both nutritional and bird-related factors play a significant role in determining fertility. King'ori[33] (2011) emphasized that the quality and quantity of the breeder diet are critical, as proper nutrition supports optimal reproductive function. Conversely, excessive weight gain may negatively affect fertility by impairing semen quality and ovulation

Hatchability Rate

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Hatchability in the present study declined with increasing storage duration, consistent with the findings of Abioja[1] *et al.* (2020), Nasri *et al.*[41] (2019), Hamidu and Adomako[21] (2018), and Khan *et al.*[29] (2013). Prolonged storage has been associated with increased early and late embryonic mortality (Elibol *et al.*,[15] 2002; Ishaq *et al*[25]*.,* 2014), a pattern also reported by Schmidt *et al.*[46] (2009) and Samli *et al.*[44] (2005). Less-developed embryos are particularly sensitive to extended storage because they contain fewer cells and are less differentiated (Grochowska[20], 2014; Fasenko *et al*.,[17] 2001). Furthermore, prolonged storage degrades albumen quality, thereby reducing embryonic viability and the proportion of high-quality chicks (Tona *et al*.,[53] 2004).

Egg shape index did not significantly affect hatchability, supporting the findings of Taha[50] (2011) and Turkyilmaz *et al*.[54] (2005). However, some studies (Meshioye *et al*.,[39] 2008; Asuquo & Okon[8], 1993) reported higher hatchability in medium to large (round) eggs. This may be attributed to their greater albumen volume and moisture content (Hegab & Hanafy[23], 2019; Ulmer-Franco *et al*.,[55] 2010), which enhances water retention essential for proper embryonic development.

Initial Weight of Chicks

The study found that egg shape index significantly affected chick weight at hatch, with round eggs producing the heaviest chicks. This finding contrasts with earlier reports by Iqbal et al.[24] (2017) and Alasahan & Copur (2016), who observed no significant effect of shape index on chick weight. The results of the present study may be attributed to the heavier weight of round eggs, which likely provide greater yolk reserves to support embryonic development and contribute to higher chick weight at hatch.

Weekly Weight of Chicks

Chicks from round eggs remained heavier during the first week, while weights became comparable by the second week, likely due to uniform brooding conditions. By the third week, both shape index and storage duration influenced chick weight, with chicks from normal and round eggs maintaining higher weights. These findings are consistent with previous studies by Khulel & Sabri[32] (2020), Al-Nedawi *et al*.[6] (2019), and Petek *et al*.[42] (2010), which indicate that egg size and shape can influence early chick growth.

CONCLUSIONS

Based on the summary of the findings, the following conclusions were drawn:

1. Egg shape index has limited influence on most internal egg quality traits, affecting only egg weight and yolk height. However, several quality parameters such as egg weight loss, albumen height, yolk and albumen weight, and Haugh unit are influenced by the interaction between storage duration and egg shape index. Yolk color remains unaffected by both

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factors. Practically, this indicates that egg storage management is more critical than egg shape alone in maintaining egg quality, and producers should prioritize proper storage duration regardless of egg shape classification.

2. Fertility of Philippine native chicken eggs is not influenced by either storage duration or egg shape index. However, hatchability is affected by storage duration. This suggests that while egg selection based on shape is unnecessary for fertility, minimizing storage time is essential to maintain high hatchability, emphasizing the importance of timely incubation practices in hatchery operations.
3. Chick weight from hatch up to the first week is influenced by egg shape index, while growth performance in later stages is less affected, except during the third week where both storage duration and shape index independently influence weight. Chick survivability during brooding is not affected by either factor. In practical terms, egg shape may be considered when uniformity of early chick size is desired, but it has minimal long-term impact on growth and survival, indicating that management practices during brooding remain more critical than initial egg characteristics.

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