

Quality Assessment of Eggs from Quails and Chickens

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Abstract

Consumption of fertile eggs will provide more nutrients than infertile eggs, is the focus of the study. 120 chicken (layer) eggs and 120 quail's birds were housed from day old to 24 weeks. 60 birds each were separated as treatment A to produce infertile eggs, while treatment B had 54 hens with 6 cocks, to produce fertile eggs in a factorial arrangement. Birds on treatment A were fed compounded layer mash, while those on treatment B were fed compounded grower mash. The eggs produced were evaluated for chemical and physical characteristics at the end of the study. Results revealed that, the egg albumen from both quail and chicken had significantly ($p < 0.05$) higher protein and moisture contents compared with egg yolk and whole egg. The fried products had 4 times higher protein content than the fresh or boiled component for all nutrients measured significantly. Egg yolk had the significantly ($p < 0.05$) highest values for ether extract and ash contents than other components measured, for both birds. The infertile eggs had significantly ($p < 0.05$) higher nutrients, cholesterol and viscosity levels than the fertile eggs. Chicken eggs had the highest protein content but lowest ether extract than quail for both fertile and infertile egg parameters measured. Minerals content of infertile eggs from chicken was higher than the fertile eggs, infertile and fertile eggs from quail birds. Infertile eggs from both chicken and quail had significantly ($p < 0.05$) highest values for physical parameters except for egg shell weight.

Albumen had more than half of egg protein content, while egg yolk was best in ether extract, minerals and cholesterol contents. There was no significant difference for fertile and infertile eggs of both birds but for minerals and physical parameters, infertile eggs performed better. Therefore, consumption of fertile eggs will not give more nutrients than infertile eggs.

Introduction

Our body needs protein to repair and replace damaged tissues, animal proteins are best in form of milk, egg and meat but majorly, people consume more meat than milk and egg [1]. Eggs are a nutritious food and are part of a healthy diet, it is a wholesome food which contains balanced amount of essential nutrients like protein, vitamins and minerals, and so it is said to be a complete food [2]. Eggs have biological value of 93.97% comparable to 84.55% for milk, 76% for fish and 74.3% for beef [3]. General nutritional composition of a unit whole egg of 60g per weight will have 65-68% of water, 70kcal of energy, 6.3g of protein, 0.36g of carbohydrate, 4.8g of total fat, 1g of polyunsaturated fat, 1.8g of monounsaturated fat, 1.6g of saturated fat, 185mg of cholesterol, 126mg of choline, 270 IU of vitamin A, 41 IU of vitamin D, and 0.5 mg of vitamin E [4]. Crunchy (2013) [5] observed (10.9%) protein, (0.36%) minerals, (0.0001%) Vitamins, (0.17%) fats and (0.71%) carbohydrate in chicken eggs while other eggs like quail have, calorie (158Kcal), fats (1g), protein (1.17g), carbohydrate (0.04%), vitamin (5.80%) for quail. Moreover, the populace consumes more table chicken eggs majorly than any other poultry eggs because, it is readily available, almost all farmers are into the production and so infertile eggs are not scares in the market. Crunchy (2013) [5] also reported that the consumption of eggs by some individuals is due to some nutritional values of egg, like having high level of protein and good source of omega-3 fatty acids, vitamins and minerals which can be used for hair and body problem. Ashley (2011) observed that low protein intake in underdeveloped countries such as Nigeria despite the high egg production in the country [6]. It was also observed that people especially from African countries run away from eating eggs, because of the believe that eggs could lead to a lot of health issues like heart diseases. Therefore, many adults eat egg without the the yolk. The question then is which one is better, the egg white or the egg yolk? Also majority believed that fertile eggs have less cholesterol as compared with infertile eggs, and so may pose no health issues in adults. The difference between fertile and infertile eggs is that a fertile egg is produced from the union of cock and hen by introducing its sperm which forms a blastoderm in the yolk of such eggs. Billy (2017) [7] defined fertilized egg as one that has been laid by a chicken who has mated with a rooster. These eggs appear a slight bit more opaque than infertile eggs. He noted that fertilized eggs have less cholesterol than non-fertilized eggs. While there may be a slight difference in the structure of the cholesterol. Eating up to 4 egg yolks per week has not been shown to increase the risk of heart diseases but the American Heart Association recommended 300mg or less of cholesterol intake. The cholesterol level in eggs, either fertilized or in fertilized, has little or nothing to do with heart diseases. Gold (2016) [8] observed that there is no difference in the taste of fertile and infertile eggs but reported that the taste depends on the food given to the birds. Quail eggs are considered low in fat and contain more nutrients than chicken eggs. Research have shown that quail egg has a lot of health benefits but there is a need to evaluate the nutritional value of chicken and quail eggs.

Materials and Methods

Experimental Birds

A total of 120 Japanese quails (*Coturnix japonica*) and 120 chickens (Harco black) were purchased from a reputable farm and the required vaccinations were administered to them. They were raised from day old, fed with chick mash for 8 weeks. After 8 weeks, 60 quails and 60 chickens were separated as treatment A and fed with compounded layers' mash to produce table infertile eggs while 60 quails (54 hens and 6 cocks) and 60 chickens (54 pullets + 6 cocks) were also separated as treatment B and fed with compounded growers mash to produce fertile eggs. The fertile and infertile eggs of both chicken and quails were collected in separate crates and taken to the laboratory for analysis.

Table 1: Feed composition of chick, grower and layer mash fed to chickens and quail birds

Ingredients	Chick (Kg)	Grower (Kg)	Layer (Kg)
Maize	45.00	48.00	50.00
Soyabean cake	34.00	25.00	25.00
Wheat Offal	13.10	08.00	06.00
Palm Kernel Cake	-	07.00	05.00
Bone Meal	03.00	04.00	04.00
Fish Meal	-	-	02.00
Oyster Shell	04.20	07.00	07.00
Lysine	00.10	00.20	00.20
Methionine	00.10	00.20	00.20
Premix	00.25	-	-
Grower Premix	-	00.25	-
Layer Premix	-	-	00.25
Salt	00.25	00.40	00.40
Percentage energy	2650ME Kcal	2500MEKcal	2600ME Kcal
Percentage Crude Protein	20%	15%	16 - 17%

Processing Methods

A total number of (90 fertile and 90 infertile) eggs from both quail and chicken were separated into egg yolk and egg albumen manually. Another 90 fertile and 90 infertile eggs were used as whole eggs or egg mixture. Out of the 90 egg yolks obtained, 30 fresh egg yolks were identified and replicated three times, 30 eggs yolk were boiled at 100°C for 5 minutes and also replicated three times, while the remaining 30 egg yolks were fried using 5%/wt of pure vegetable oil at 100°C for 2 minutes. The same procedure was also followed for the 90 eggs albumen and the whole egg / mixture of both.

Proximate Analysis

Protein, ether extract, ash and moisture contents of fertile and unfertile quail and chicken eggs, (fresh, boiled, fried) were determined using the procedures of Association of Official Analytical Chemist [9].

Mineral Composition

The minerals composition (calcium, phosphorous, sodium, zinc, iron and potassium) of fertile and infertile quail and chicken eggs, were determined using the methods described by Association of Official Analytical Chemist [9].

Determination of Cholesterol in Foods

2 g of food sample was weighed into a 2.50ml beaker, 50ml of hot 95% ethanol was added, followed by the addition of 150ml mixture of ethanol and diethyl ether in the ratio of 1:1. The mixture was placed inside a water bath set at 60°C for thorough homogenization and was boiled for 5mins. The precipitate was washed with 95% ethanol and 2 ml of NaOH was added, boiled for 2hours to 1/5 of the original volume. 100ml of saturated solution of Ca(OH)₂ was added and filtered, dried at 80°C. 100 ml of diethyl ether was added to extract all the cholesterol for 30 minutes. The sediment after filtered was washed, while ether was allowed to evaporate. The dry sediment was dissolved in 10ml of chloroform, 2ml of acetic acid anhydride added and 4 drop of 96% H₂SO₄, and placed in the dark for 30mins. 0.5µg/ml of cholesterol working standard were prepared from 50µg/ml of cholesterol stock solution and treated similar as above [10].

$$\text{Cholesterol in mg/100g} = \frac{\text{Absorbance of extract} \times \text{gradient factor} \times \text{Dilution factor}}{\text{Wt of samples taken}}$$

Viscosity of Egg

This was measured according to (Antonio et al., 2012) [11].

Physical Analysis

Yolk weight, albumen weight, whole egg weight and egg shell were measured using an egg separator and the laboratory sensitive scale manufactured by Carmy EK3250. The egg yolk colour was evaluated by means of the usual La Roche scale name as DSM Yolk Colour Chat [12].

Statistical Analysis

Factorial design was used for the experiment, and all data obtained were subjected to analysis of variance using the Statistical Analysis System [13]. Significance difference among means were compared using Duncan's Multiple Range (DMR) Test in the SAS package.

Results

Table 2, shows the proximate composition of egg component from fertile and infertile quail. Fried albumen had the highest protein content significantly ($p < 0.05$), and the fresh albumen, with higher moisture content, also the yolk had the higher ether extract and ash content when the eggs were fried. Quail eggs yolk had significantly ($p < 0.05$) higher ether extract and ash content especially when the yolk was fried. Values obtained in fertile and infertile eggs irrespective of the processing method used had similar values than fertile eggs for all parameters measured. It was also observed that the fried egg components values were about 4 times higher than their fresh and boiled equivalent values.

Table 2: Proximate composition of fertile and infertile quail eggs (%)

Egg comp.	Parameters	Protein	Either extract	Ash	Moist.	Protein	Either extract	Ash	Moisture
Yolk	Fresh	09.73 ^e	22.75 ^c	00.90 ^d	60.00 ^c	09.23 ^c	22.53 ^c	01.01 ^b	61.62 ^c
	Boiled	09.92 ^e	24.69 ^c	00.68 ^e	63.40 ^c	10.77 ^c	24.15 ^c	00.68 ^c	59.82 ^c
	Fried	35.17 ^c	54.60 ^a	04.01 ^a	08.43 ^c	38.35 ^c	57.50 ^a	03.90 ^a	07.70 ^c
Album	Fresh	15.24 ^d	00.69 ^f	00.88 ^d	86.60 ^a	13.73 ^d	01.10 ^f	00.80 ^b	86.50 ^a
	Boiled	15.33 ^d	01.95 ^f	00.59 ^e	86.00 ^a	15.64 ^d	01.77 ^f	00.57 ^c	85.45 ^a
	Fried	69.68 ^a	15.50 ^d	01.90 ^c	14.80 ^d	68.49 ^a	17.50 ^d	01.45 ^b	15.11 ^d
Whole Egg	Fresh	11.66 ^d	11.65 ^e	00.90 ^d	72.90 ^b	11.42 ^c	12.43 ^e	01.02 ^b	72.40 ^b
	Boiled	12.77 ^d	12.54 ^e	00.62 ^e	73.10 ^b	12.78 ^d	12.46 ^e	00.82 ^c	71.70 ^b
	Fried	43.03 ^b	47.50 ^b	02.35 ^b	12.12 ^d	43.28 ^b	51.50 ^b	03.71 ^a	10.51 ^f
SEM		00.03	00.35	00.09	00.10	00.03	00.35	00.09	00.10

^{abcdef}: Means on the same column with different superscripts are significantly different ($p < 0.05$).
 Comp. = Components; Moist. = Moisture; SEM = Standard error of mean

Table 3, shows the proximate composition of egg components from fertile and infertile chicken eggs. The findings in this results followed the same trend as in Table 2 above, except that the values obtained were higher in chicken ($p < 0.05$) than values gotten for quail eggs.

Table 3: Proximate composition of fertile and infertile chicken eggs (%)

Egg comp.	Parameters	Fertile				Infertile			
		Protein	Either Extract	Ash	Moist.	Protein	Either Extract	Ash	Moist.
Yolk	Fresh	09.13 ^e	29.32 ^c	00.95 ^d	51.79 ^c	08.95 ^f	30.37 ^c	00.95 ^c	51.79 ^c
	Boiled	10.79 ^e	30.94 ^c	00.64 ^d	50.22 ^c	09.64 ^f	32.73 ^b	00.67 ^d	50.43 ^c
	Fried	33.94 ^c	61.50 ^a	04.77 ^a	08.31 ^c	34.36 ^c	62.50 ^a	04.91 ^b	12.40 ^d

Album	Fresh	16.32 ^d	00.99 ^f	00.83 ^d	87.72 ^a	16.35 ^d	00.85 ^f	00.86 ^d	87.71 ^a
	Boiled	14.42 ^d	01.39 ^f	00.59 ^d	86.20 ^a	18.04 ^d	00.98 ^f	00.57 ^d	86.34 ^a
	Fried	74.22 ^a	12.50 ^d	01.17 ^c	13.51 ^d	75.70 ^a	12.50 ^e	01.18 ^c	15.82 ^d
Whole Egg	Fresh	11.23 ^d	08.37 ^e	00.84 ^d	76.77 ^b	12.44 ^e	08.22 ^e	00.91 ^c	76.48 ^b
	Boiled	12.02 ^d	08.35 ^e	00.65 ^d	77.46 ^b	12.92 ^e	16.10 ^e	00.72 ^c	73.47 ^b
	Fried	48.32 ^b	40.50 ^b	02.32 ^b	13.86 ^d	52.88 ^b	41.50 ^b	02.44 ^a	10.18 ^d
	SEM	00.03	00.35	00.09	00.10	00.03	00.35	00.09	00.10

^{abcdef}: Means on the same column with different superscripts are significantly different (p < 0.05).
 Comp. = Components; Moist. = Moisture; SEM = Standard error of mean

Table 4, showst mineral composition, cholesterol and viscosity content of fertile and infertile quail and chicken eggs. Quail eggs had the lowest values (p < 0.05) mineral content than chicken eggs. The fertile eggs from quail and chicken had lower (p < 0.05) mineral composition than infertile eggs of both birds. The cholesterol and viscosity of infertile eggs are higher (p < 0.05) than fertile eggs.

Table 4: Mineral composition, cholesterol and viscosity of fertile and infertile quail and chicken eggs

Poultry Species	Egg Condition	Ca (mg)	P(mg)	Na (mg)	Zinc (mg)	Iron (mg)	K (mg)	Cholesterol (mg/100)	Viscosity (ml/s)
Quail eggs	Fertile	11.45 ^d	40.65 ^d	18.95 ^d	03.35 ^c	00.21 ^c	19.85 ^d	10.00	16.20
	Infertile	14.50 ^c	46.85 ^c	29.15 ^c	03.90 ^c	01.20 ^b	22.50 ^c	36.49	28.49
Chicken Eggs	Fertile	38.25 ^b	152.20 ^b	36.55 ^b	04.65 ^b	01.90 ^b	41.20 ^b	1150	57.20
	Infertile	43.00 ^a	180.30 ^a	56.70 ^a	07.00 ^a	03.10 ^a	74.75 ^a	1300	69.20
	SEM	00.76	00.79	00.50	00.23	00.18	00.85	01.21	0.62

^{abcd}: Means on the same column with different superscripts are significantly different (p < 0.05).
 Ca = Calcium; P = Phosphorus; Na = Sodium; K = Potassium; SEM = Standard error of mean

Table 5, shows the physical parameters from fertile and infertile quail and chicken eggs. All parameters measured showed that chicken eggs had significantly (p < 0.05) higher yolk weight, albumen weight, egg weight and shell weight, while the yolk colour was significantly (p < 0.05) lower. Also the table showed that infertile eggs from quail and chicken had significantly (p < 0.05) higher values for all parameters measured compared to fertile eggs.

Table 5: Physical Characteristics of Quail and Chicken Eggs(g)

Poultry Species	Egg Condition	Yolk Weight	Albumen Weight	Egg Weight	Shell Weight	Yolk Colour
Quail	Fertile	04.19 ^c	04.53 ^d	10.88 ^d	00.38 ^c	04.08 ^b
	Infertile	04.32 ^c	05.20 ^c	11.28 ^c	00.47 ^d	04.00 ^b
Chicken	Fertile	14.86 ^b	36.00 ^b	58.81 ^b	00.46 ^b	05.00 ^a
	Infertile	23.77 ^a	46.92 ^a	66.76 ^a	00.55 ^a	04.00 ^b
	SEM	00.03	00.05	00.02	00.01	00.04

^{abcd}: Means on the same column with different superscripts are significantly different ($p < 0.05$).

SEM = Standard error of mean

Discussion

Eggs are among the most nutritious foods in the world because it is an excellent source of protein. To meet up with recommended daily protein requirement, egg will be the first option to boost protein intake at every meal. Daniel (2015) [14] reported that women need approximately 46g of egg per day, while men require 56g according to Center for Diseases Control and Preservation USA.

The proximate composition of egg components from fertile and infertile quail and chicken eggs (Table 2 and 3). The proximate composition of infertile eggs agrees with the findings of Grace (2011) who observed that egg white which is also referred to egg albumen are of low calorie, fat free food, with bulk of protein about 4g while egg yolks carry the cholesterol, the fat and saturated fat. The author also reported that what is often overlook by people are the nutrients that comes with the fat, such as the fat-soluble vitamins, essential fatty acid and other nutrients. Zaib-Ur-Rehman (2015) [3] observed that the major parts for consumption are both the albumen and the yolk. The albumen account for the most of eggs liquid weight of about 67%, which comprises more than half of the egg total protein of which could be seen in table 2 and 3. He noticed that the egg albumen tends to thin out as the egg ages because its protein changes.

Tunsalingkain et al. (2013) [15] reported that egg yolk (or yellow portion of the egg) makes up about 33% of the liquid weight. It also contains all the fat and a little less than half of the protein. With the exception of riboflavin and niacin, the yolk contains a higher proportion of the egg's vitamins (A, D and K) than the egg albumen. The yolk also contains about 59 Calories. The yolk will weigh 60g of 100g weigh of an egg, of which 50% is solid matter and 50% water. It contains about 6grams of lipids, 3grams of proteins. The egg lipid has 65% Triacylglycerol, 28.3% phospholipids 5.2% free cholesterol, cholesterol ester and free fatty acid in traces [16].

The findings of Grace (2011) and Zaib-Ur-Rehman (2015) [3] agrees with the results obtained in table 2 and 3, but greater than values reported by (Babayemi et al., 2014) [17]. Many authors reported that fertile and infertile eggs have similar nutritional quality except that fertile eggs can hatch into chick. Apart from these physical differences, other nutritional qualities are the same for both fertile and infertile eggs [18].

The results obtained in table 2 and 3 agrees with the findings of (Pragya, 2016) [18]. USDA (2012) [19] noted that there are no nutrients differences between fertile and infertile eggs and that there are also no differences in their safety for consumption, provided the eggs have been handled and stored properly, and that fertile eggs need to be stored below 40 - 50°F, or else no embryo development will be formed. The increase in values observed in boiled and fried eggs was similar to those reported by Okubanjo and Egbunike (1999) [20] that processed animal product, like, Intermediate Moisture Food (IMF) do have low moisture content and three to four times the raw protein equivalent hence they are less bulky. Kinsman (1982) [21] also observed that vitamin and minerals which are the ash content in food, especially meat remain unchanged when cooked.

Table 4: Minerals are inorganic substances that are vital for good health and they are essential for regulating and building the cells which makes up the body. They also help to maintain the volume of water necessary for the life processes and to draw chemicals substances into and out of the cells [22]. They help to keep the blood and tissue fluids from becoming either too acidic or too alkaline. The greater values obtained for chicken eggs could be as a results of the sizes of the chicken eggs compared to quail eggs size. This simply nullify the belief that quail eggs are better than chicken eggs.

Calcium plays an important role in the maintenance of health. It is called the prime instigator of vital activity. It is essential for the proper development of bones and teeth, also necessary for the normal action of the heart and all muscle activity. It aids the clotting process of the blood and stimulates enzymes in the digestive process. Bakhru (2010) [23] stated that the recommended daily allowances of calcium is 400mg for adults men and women, 100mg for pregnant and lactating women, 500mg for infant and 600mg for children of ages 6 - 12. The amount of calcium in the eggs in this study ranged from 11.45 - 43.00g, which implies eating at least an egg daily could help to meet up with the daily requirement for calcium in the body.

Phosphorus is indispensable for all active tissues especially when combine with calcium. It feeds on the nerves. It aids the growth of hair and helps to counteracts fatigue. It's important for the regular function of the heart and for normal kidney functioning. The recommended daily allowance is 800mg for men and women and 330mg for children. The total phosphorus in the quail and chicken eggs in this study ranged from 40.65 to 169.29mg, which means that egg is a good suppliers of phosphorus in the body [23].

Sodium is the most abundant cation in the extra cellular fluid of the body. It acts with other electrolytes especially potassium in the intracellular fluids to regulate the osmotic pressure and maintains proper water balance within the body. It is a major factor in the maintenance of acid-base equilibrium. Bakhru (2010) [23] stated that the recommended daily allowance for men and women is 10 -15g while that of children is 5 - 10g. The value obtained for sodium in this study is lower than the normal requirements which could be due to the mineral content of the feed consumed by the birds.

Zinc is needed for a healthy skin and hair, proper healing of wounds, successful pregnancy and male virility. It plays vital roles in guarding against diseases and infection. At least all the enzymes in the body require zinc for their functioning. The recommended daily allowance of zinc is between 10 - 15 mg for men and women [23].

Iron is essential for life and is necessary for the production of haemoglobin. Haemoglobin is composed of four iron-containing heme groups and it enables the blood to move, as oxygenated blood from the heart to other part of the body. The recommended daily allowance for men is 28mg and for women is 30mg while pregnant women is 38mg and children is 26 - 40mg [1]. The level of Iron observed in this study for both quail and chicken eggs ranged from 00.21 - 3.10mg which is lower than the recommended intake, but can be an added advantage when consume, since egg is not the best food source of iron.

Potassium is important as an alkaline agent. It maintains a proper acid-alkaline balance in the blood and tissues. It prevents hyperacidity and is essential for muscle contraction and proper functioning of the heart -especially for maintain a normal heartbeat. Potassium aslo promotes the secretion of hormones and helps the kidney in detoxification of blood. Adeyeye, (2010) [22] noted that the recommended daily allowance for men and women is 17 - 55g and children is 9 - 30g. In this work potassium in egg ranged from 19.85 - 74.75mg. In a nutshell, egg especially from chicken has a lot of minerals needed in the body and consuming at least two eggs per day could help to maintain good health.

Cholesterol refer to a group of chemicals containing both protein and fat components (lipoprotein) that are present in every living cell and it aids in production of hormones and for the development of brain and nerves in the body. It also serves as the starting material from which the liver produces bile acids, and is necessary for digestion of fats. It is the key substances in the wall of every cell and precursor for production of steroid hormones by the adrenal glands and gonads. In this study, cholesterol content of quail eggs is very low to that of chicken eggs, and this may be the only reason why quail eggs are accepted and preferable to chicken eggs. In the same vein, this study observed that the cholesterol content of infertile eggs washigher than fertile eggs, which could be attributed to the feed fed to birds, mating of the birds by roosters and the size of the eggs. The results obtained from this study disagrees with the findings of Kazimierskal *et al.*, (2005) [24] who compared the cholesterol content of chicken and quail eggs and Stepinska *et al.* (1993) [25] who also compared eggs of Island red and green legged hens.

Cholesterol is an essential component of all cells in the body of chickens, humans and all animals. They do not occur in plants. Zaib-Ur-Rehman (2015) [3] stated that, cholesterol content of eggs became an important issue for consumers in the 1970's and 1980's when it was discovered that, among the human population, those with high cholesterol levels in their blood (usually referred to as "serum cholesterol") were at greater risk of heart attacks and/or atherosclerosis. While this statistical connection is an important one in terms of human health, there have been decisive slipups in its explanation. There is effectively no link between the cholesterol most people consumed in their diets, and their serum cholesterol levels [26].

There are two types of cholesterol, low density lipoproteins (LDL) and high density lipoproteins (HDL). Low density lipoproteins also called bad cholesterol carry most of the cholesterol in the blood. The cholesterol and fat from the LDLs are the chief source of dangerous build up and obstruction in the arteries. Thus, the more LDL cholesterol in the blood causes the greater chance of heart diseases. Nature has provided good cholesterol (HDL) in the egg yolk, it is in minute quantity but very effective. High density lipoproteins also named as good cholesterol, this cholesterol goes back to liver, which leads to its removal from the body so HDLs help to keep cholesterol from building up in the walls of arteries, if level of good cholesterol is low, risk of heart diseases is greater.

Egg yolk consist of 68 percent LDL and 16 percent HDL. So, the commonly used drugs to lower blood pressure stop the production of the hormone angiotensin to narrowing the body's blood vessels. Hu et al (1999) [26] identified several different peptides in boiled and fried eggs that act as potent angiotensin converting enzyme (ACE) inhibitors, which showed that enzymes in the stomach and small intestine produce these peptides from eggs. Keys, (1952) [10] reported that a single large egg has less than 200g of cholesterol and consumption of 2 -3 daily over a long period of time has never shown to have more than a minimal impact on serum cholesterol.

Table 5 shows the physical parameters of fertile and infertile eggs of quail and chicken. The reduced weight observed in this study for egg yolk, albumen and shell for fertile eggs of both quail and chicken is similar to the report of Song et al. (2000) when comparing the egg quality of , chicken, quail and guinea fowl [27-29].

Conclusion

Fertile eggs do not process more nutrients than infertile eggs, however, infertile eggs had more cholesterol compared to fertile eggs. Further studies could be carry out to evaluate on the type of cholesterol in eggs (Infertile and fertile eggs).

Conflict of Interest

None

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