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Nutritional analysis of some common avian edible eggs of district Anantnag (Jammu and Kashmir)

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Abstract

It is a well-established fact that apart from topography, there are some other variables (e.g., Size and weight) which determine the nutritional values of an egg. It is an established and well proven fact that, the age of a hen is directly proportional to the increase in the size of eggs. Furthermore, the size of an egg is inversely proportional to the amount of yolk present in an egg i.e. smaller the size of an egg larger the amount of yolk and larger the size of an egg, smaller the amount of yolk. With increase in age of hens, there is subsequent decrease in the egg shape index. With interaction of breed with age, the traits of egg shell may be affected.

Materials and Methods: Different types of avian edible eggs as unfertile, white double yolked, desi and organic eggs were obtained from local poultry farm from District Anantnag Jammu and Kashmir. These eggs were subjected to different types of analyses and experimentation. Invitro digestion was done and then they were freeze dried at -70°C till further experimentation. Protein estimation was done by Hatree - Lowry method (1951), Cholesterol test was done by Liebermann-Burchard method, sodium and potassium were determined by flame photometer, Free radical scavenging activity was determined by DPPH based on the method given by Brand Williams 1995 and ABTS by Re et.al.,1999. Zinc (Zn) Iron (Fe) and Calcium (Ca) were determined by Atomic Absorption Spectroscopy (AAS).

Results: After lab. Experimentation it was proven that, double yolked eggs have highest weight of average 68.02 gms followed by organic eggs 60.58 gms, desi eggs, 60.30 gms and Unfertilized eggs 55.05gms respectively. Double yolked egg was found with highest protein content of 10.5 mg/ml followed by organic Eggs with 8.05mg/ml, unfertilised eggs with 7.87mg/ml and desi eggs with 7.67 mg/ml respectively. Highest amount of cholesterol was found in double yolked eggs with 8.01 ± 0.005 mg/ ml. Highest amount of zinc and calcium 0.17 mg/l and 3.03mg/l respectively was found in unfertilised eggs. Strong antioxidant activity and scavenging activity was found in desi eggs with $13.09\mu\text{mol/l}$ and $62.11\mu\text{mol/l}$ respectively.

Conclusion: After our experimentation it can be concluded that eggs are rich in nutrients, Minerals and are loaded with high scavenging and antioxidant properties. Eggs can be used as supplement food stuffs, Therapeutic foods and can be used by different food industries in different aspects to explore many more things.

Keywords: Eggs, nutrition, proteins and cholesterol

Introduction

Balanced diet is an important and basic part of good health. Among different factors, diet components have the leading role in determining the good health of an individual. In the diet component, Eggs have a special place with rich nutritional profile along with the low-calorie count produced by them. Eggs can replace Fish, Meat and chicken because they contain proteins and mostly all essential amino acids (Sparks 1). It has also been proved that, size of an egg is directly proportional to the age of a hen i.e. with the increase in the age of a hen there is also an increase in the size of an egg. Furthermore, there is a greater quantity of yolk in eggs that are smaller in size. Surai *et al.* [2] has illustrated that the nutritional values of an egg can be calculated by ensuring the weight of an egg. Van den Brand *et al.* [3] had proven that with the increase in age of hens, there is the subsequent decrease in the egg shape index and with the interactions of breed with age, the traits of egg shell may be affected [4].

Material and methods

Different types of edible avian eggs used for this study were unfertilised eggs, two yolked eggs, Desi eggs and organic eggs, which were obtained from a local poultry farm from

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District Anantnag, Jammu and Kashmir. 20 eggs from each category were selected for this study, out of which two eggs from each variety were studied after an interval of 20 days. Thickness of the shells and weight of the eggs were measured and examined by standard physical methods.

In vitro gastrointestinal digestion

In vitro digestion of the biological components was done by following the method of Miller *et al.*, (1981). Eggs were homogenized at 1500 rpm for 7 min and 1ml of homogenate was mixed with 10 ml of pepsin solution (1gm of pepsin dissolved in 200 ml of 0.1mol/L HCl) and pH was adjusted at 2.0 (acidic). The mixture was then kept in shaking incubator for 2 hours at 37°C. To this whole mixture 10 ml of bile solution was added (1gm of bile in 200 ml of distilled water), and the pH was adjusted at 6 and further incubation was done in a shaking incubator for 30 minutes. This was followed by intestinal digestion which was performed by adding 10 ml of trypsin solution (1gm of trypsin in 0.1 mol/L of NaHCO₃), 10 ml of amylase and 10 ml of lipase was also added (1gm of amylase and lipase respectively in 200 ml of DW), the pH was set at 8.0 (basic) and kept in shaking incubator for 2 hours at 37°C. After hydrolysing,

the enzymes were deactivated (heat deactivation) by keeping the samples in boiling water for 5-10 minutes and then centrifuged at 10,000rpm for 10 minutes. The supernatant was taken and freeze dried at -70°C for further use in:

Protein Estimation: By Hatree – Lowry method.

Cholesterol Test: By Libermann-Burchard method.

Sodium and Potassium Determination: By Flame photometer

Free radical scavenging activity: By DPPH method given by Brand- Williams 1995 and ABTS by Re *et al.*, 1999.

Zinc, Iron, and Calcium: By Atomic Absorption Spectroscopy (AAS)

Results

By physical examination, double yoked egg was found to have the highest weight of average 68.02gms followed by organic egg with 60.58gms, followed by desi eggs with 60.30gms and unfertilised eggs with 55.05gms respectively. Weight of the shell was found highest in Double yoked egg with 8.55gms, unfertilised with 7.97, desi with 6.95 and organic egg with 6.17 gms respectively. (Table 1).

Table 1: Physical characteristics of sample

S. No	Characteristics	Double yolk						Mean	unfertilized						
		1	2	3	4	5	6		1	2	3	4	5	6	Mean
1	Total weight of egg (gms)	65.32	67.84	64.28	74.90	68.30	67.52	68.02	56.73	56.11	61.24	56.58	60.57	54.09	55.05
2	Weight of Shell (gms)	7.13	7.55	7.40	9.32	7.01	6.92	8.55	6.87	7.93	7.24	6.94	6.93	6.84	7.97
3	Thickness of shell(mm)	0.377	0.35	0.35	0.35	0.37	0.38	0.36	0.39	0.27	0.36	0.34	0.40	0.47	0.37
4	Total albumin(ml)	39	34	34	33	35	32	34.5	34	34	39	40	39	35	36.83
5	Total yolk(ml)	19	18	26	35	35	30	27.19	14	13.05	15.07	15	15	20	15.35

Table 1: Contd...

S. No	Characteristics	Desi						Mean	Brown Organic						
		1	2	3	4	5	6		1	2	3	4	5	6	Mean
1	Total weight of egg (gms)	60.51	57.15	55.15	54.50	62.57	59.95	60.30	55.29	55.789	53.29	56.29	55.88	57.89	60.58
2	Weight of Shell (gms)	7.23	6.37	7.07	6.87	6.94	7.23	6.95	6.92	5.94	6.37	5.87	5.97	6.23	6.17
3	Thickness of shell(mm)	0.27	0.39	0.40	0.47	0.38	0.33	0.37	0.42	0.36	0.35	0.36	0.41	0.41	0.39
4	Total albumin(ml)	40	30	30	30	30	30	31.66	30	20	35	25	30	20	26.6
5	Total yolk(ml)	15	15	15	20	25	20	18.33	30	20	15	20	20	27	22.51

Total protein

From our whole study, it was found that double yoked egg has the highest protein content of 10.5 mg/ml, followed by organic egg with protein content of 8.05 mg/ml, followed by unfertilized egg with protein content of 7.87mg/ml and desi eggs with a protein content of 7.67mg/ml respectively.

Cholesterol

Cholesterol determination revealed that double yoked egg has the highest amount of cholesterol 8.01 mg/ml followed by Unfertilized eggs with 6.82 mg/ml, followed by organic eggs with 5.67 mg/ml, followed by desi eggs with 4.23 mg/ml respectively.

Determination of sodium and potassium by flame photometer

Ions are the essential components of the body as they are important in maintaining the balance within the body and among these ions, measure role is being played by sodium and potassium. The egg is found to be a good source of

these ions. After making thorough comparison among different types of eggs for the sodium and potassium levels, it was found that double yoked egg have the highest amount of sodium and potassium as- 15.31 mg/ml and 2.55 mg/ml respectively, followed by Desi by an amount of 12.24mg/ml and 2.53 mg/ml respectively, followed by Unfertilized egg with 12.04 mg/ml and 2.49 mg/ml, followed by organic egg with 11.97 mg/ml and 2.47 mg/ml of Na and K respectively.

Zn, Fe and Ca

The whole study was also made to explore the presence of the amount of some of the other ions in these eggs under study. The unfertilized egg was this time found to have highest zinc value of 0.16mg/l, followed by double yolk with 0.11mg/l, followed by desi eggs with 0.09mg/l, followed by Organic egg with 0.06mg/l. (Table 2) Level of Iron (Fe) was found almost same (<0.17) among all types of eggs with negligible variations.

Calcium (Ca) levels were also measured in all eggs in this type of study and Unfertilized egg was leading type with

2.97 mg/l, followed by organic egg with 2.86mg/l, followed by desi egg with 2.82mg/l, followed by double yoked egg with 1.97mg/l, respectively.

Table 2: Minerals

Sample	Iron (mg/l)	Zinc (mg/l)	Calcium (mg/l)
Double yoked egg.	< 0.20	0.11	1.97
Unfertilized egg.	<0.20	0.16	2.97
Desi egg	<0.20	0.09	2.82
Organic egg.	<0.20	0.06	2.86

Antioxidant activities

DPPH

Desi eggs showed strong antioxidant activity (13.09 $\mu\text{mol/L}$) than other edible eggs. The unfertilized egg was found to have lowest antioxidant activity (10.11 $\mu\text{mol/L}$).

ABTS

The scavenging ability of desi egg is highest (62.11 $\mu\text{mol/L}$) suggesting that it has strong antioxidant potential than other avian eggs. (Table 3)

Table 3: Scavenging activity

Avian Eggs	% Scavenging activity	
	ABTS	DPPH
Double yolk	21.74	11.87
Unfertilized	47.82	10.11
Desi eggs	62.11	13.09

Discussion

During this whole study it was found that double-yolked eggs have high protein, sodium, potassium and cholesterol content than other forms of eggs. Desi eggs have shown strong anti-oxidative activity, which means it has comparatively good nutritive values than other forms. Calcium and Zinc were high in content in Unfertilized eggs. Double yoked eggs should be consumed with great care as they contain high amount of cholesterol (which is considered as a precursor for Heart attacks). Desi eggs are good for those suffering from oxidative stress as it provides the basic structural and ionic components which help in combating the rise of free radical generation (Reactive oxygen species and reactive Nitrogen species). Those with deficiency of minerals should consume unfertilized eggs. So, it can be concluded that eggs are rich in nutrients, Ions, vitamins and as a very rich food stuff and could be useful to the food industry in different aspects as well.

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