J. Product. & Dev., 16(1):121 - 134(2011)

CHEMICAL, MICROBIAL AND NUTRITIONAL EVALUATION OF OSTRICH EGGS COMPARED TO HEN'S EGG

A. M. El-Shawaf [1]; El-Zainy, A. R. M. [2] and Reham S.S. M.El–Dosouky [2]

[1.] *Food and Dairy Technology Department, Efficient Productivity Institute, Zagazig University, Zagazig, Egypt.*

[2.] *Home Economic Department, Faculty of Specific Education, Mansoura University, Mansoura, Egypt.*

ABSTRACT:

Ostrich eggs (5 eggs) were evaluated for their egg weight and egg components, chemical composition, nutritional value and microbiological evaluation compared to hen's egg (120 eggs).

***Results indicated that**, the ostrich egg had highest significantly (P < 0.01) egg weight (g), and so had highest percent of shell, while hen's egg showed highest significantly (P < 0.01) percent of yolk and albumen. Data indicated that Ostrich eggs are a good source of protein (44.59%), total lipids (37%), ash (3.97%), and carbohydrate (14.44%). These values were* significant (P < 0.01). *Nutritional values were, total saturated fatty acids (66.554%), total un saturated fatty acids (33.445%), total fatty acids (94.257), total cholesterol (25.83 mg/100/g on dry weight), High Density Lipoprotein cholesterol (HDL-c) (9.94 mg/100/g on dry weight), Low Density Lipoprotein cholesterol (LDL-c) (14.87 mg/100/g on dry weight), total essential amino acids (71.854%) by HPLC, vitamin E (1843.97mg/100mg), vitamin A (37004.14 IU/100 gm), zinc (Zn) 1.64 ppm, copper (Cu) 5.62 ppm, iron (Fe) 4.43 ppm, manganese (Mn) 1.79 ppm, magnesium (Mg) 0.61ppm, and selenium (Se) 1.09 mg. Microbial evaluation data showed that total count in egg shell ($3.5x10^1$ cfu/g), total count in egg yolk and egg white are zero counts, Spore - forming bacteria was zero count for egg shell, egg white, egg yolk and mix of white and yolk, Coli form group count in egg shell ($1.3x10^1$ cfu/g), Coli form group count zero count in egg shell, egg white, egg yolk and mix of white and yolk, Salmonella ssp. and L. monocytogenes of Ostrich egg shell were detected and Salmonella ssp. and L. monocytogenes were not found in egg white, egg yolk, mix of white and yolk,*

***Conclusively**, Ostrich eggs had high chemical content than hen's egg in almost parameters. Also microbial examination and*

detection of some pathogenic were safety level. So, Ostrich eggs are able to use as functional foods.
Key words: Ostrich eggs, nutritional, Chemical & microbial evaluate.

INTRODUCTION

Eggs have been called 'nature's perfect food'. This is because they are one of the few 'complete protein foods', i.e. they contain all the nine essential amino acids which cannot be manufactured from the body but must be obtained from foods. The contents of a shell egg provide all these essential amino acids, as well as, a significant number of vitamins and minerals. These contents are perfectly and naturally packaged in an egg shell (Agriculture and Agri-Food Canada 1999).

Ostrich eggs are impressive by their sheer size and one Ostrich egg (about 1600 g) is equivalent to 24 chicken eggs. The shell, which is resemblance to porcelain, can be turned into objects of art by painting or engraving. Dried albumin and yolk of eggs are extensively used in various food industries (Shahin *et al.* 2006).

Abu-Salem *et al.* (2008) Indicated that Ostrich eggs are a good source of protein (47.09%), total lipids (45.10%), carbohydrates (4.03%), and ash (3.79%),while chicken eggs were a good source of protein (47.14%), total lipids (45.13%), carbohydrates (4.71%), and ash (3.10%).

Benkhayal *et al.* (2007) found that the total fatty acids in Ostrich egg yolk and hen′s egg yolk showed the presence of (C12:0 – 0.0, 0.39%), (C14:0 – 1.35, 0.84%), (C14:1 – 0.0, 0.63%), (C16:0 – 28.85, 26.5%), (C16:1 – 6.83, 5.96%), (C 18:0 – 8.75, 8.20%), (C18:1 – 31.36, 38.97%), (C18:2 – 18.08, 16.5%), (C18:3 – 2.4, 1.12%) and (C22:6 – 2.38, 0.89%), respectively.

Shahin *et al.* (2006) found that the total cholesterol lower in Ostrich eggs than the Red chicken eggs. Total cholesterol value recorded 880 mg/100 g samples compared with (1400 mg/100 g) of Red eggs. Also, they added that mean values of total cholesterol were (880 and 1370 mg/100g), HDL (168 and 66 mg/100 g), LDL (320 and 840 mg/100g) and Triglyceride (1960 and 2320 mg/100 g) for Ostrich egg and loghorn egg, respectively.

The amounts of the following amino acids of the albumen and yolk Ostrich eggs were (mg/g sample on dry basis): Theronine (16.5 and 12.0), Valine (15.3 and 10.8), Methionine (3.0 and 3.0), Isoleucine (12.6 and 10.8), Leucine (25.8 and 19.8), Phenylalanine (12.6 and 10.2), Histidine (7.2 and 6.6), Lysine (19.2 and 17.4), Aspartic acid (24.6 and 19.2), Serine (22.5 and 18.6), Glutamic acid (41.7 and 28.2), Proline (17.2 and 18.6),

Glycine (9.9 and 7.2), Alanine (13.2 and 10.8), Cystine (6.6 and 3.6), Tyrosine (13.2 and 9.6) and Arginine (11.4 and 15.0), respectively. (Shahin *et al.* 2006).

Agriculture and Agri-Food Canada (1999) found that the content of vitamins (A and E) of hen's whole egg per 59g were (317 IU and 0.70 mcg), respectively, while McNamara and Thesmar (2005) found that the content of vitamins (A and E) of chicken whole egg per 50gm were (243.50 IU and 0.49 mg), respectively.

Mineral content of the yolk and albumen of Ostrich eggs were (Mg - 2.4 and 1.5g/kg), (Cu - 0.95 and 7.5 mg/kg), (Zn - 44.4 and 2.8 mg/kg), (Mn - 0.98 and 2.1 mg/kg) and (Fe - 65.8, 1.8 mg/kg), respectively. (Brand *et al.* 2003). (Shahin *et al.* 2006) found that there are obvious differences in some mineral salts such as manganese (9.9 and 16.7 ppm), selenium (1.6 and 0.71 ppm), zinc (56.6 and 64.2 ppm), iron (113.9 and 93.9 ppm) and copper (1.6 and 2.5 ppm) for Ostrich egg and chicken eggs, respectively.

Badr (2006) found that Microbial determination in liquid egg white, liquid egg yolk of chicken eggs total plate count were (7.50 and 6.81 Log^{10}), *Staphylococcus aureus* (3.04 and 3.25 Log^{10}), detection of *Salmonella* (+ positive and +positive). On the other hard, total bacterial counts contaminated the albumen of dried Ostrich eggs recorded $1.4x10^5$ and $1.5x10^5$ in yolk and that of defatted yolk were 3.2×10^5 cfu/g. Also showed that *Salmonella sp.* were not detected in any of the tested Ostrich egg products, but other pathogens occurred in counts above the safety level. Total *coliform* recorded (93, 240 and 150cfu/g) in albumen, yolk and defatted yolk, respectively. (Shahin *et al.* 2006).

Therefore, the aim of this work was evaluated chemical, microbial and nutritional value of ostrich eggs compared to hen's egg.

MATERIALS AND METHODS

Materials:

1. Fresh unfertilized hen's eggs (120 eggs) were obtained from commercial Poultry Farm at Mansoura City, Dakhlia Governorate, Egypt.
2. Fresh Unfertilized Ostrich eggs (5 eggs) were purchased from Abad El-Rahman Farm - El- Obour City, Egypt. All eggs were stored at 4ºC.

Methods:

1. Egg weight and egg components:-

Individual weight of eggs was recorded to nearest hundred grams. Yolk weight and shell weight with adhering membranes of each egg were also weighted. Albumen weight was calculated by subtracting yolk and

shell weight from whole egg weight. Yolk, albumen and shell percentages were calculated. The present study was carried out in Home Economics Department Laboratory, Faculty of Specific Education, Mansoura University, Mansoura, Egypt.

2. Chemical analysis:-

a. Gross chemical composition (Moisture, crude fat, crude protein, fatty acids and ash) according to the method described by A.O.A.C. (2000). While, carbohydrates were calculated as described by Pearson, (1973) were carried out in Home Economics Department laboratory, Faculty of Specific Education, Mansoura, University Mansoura, Egypt.

b. Determination of vitamin E according to Pearson (1976) and vitamin A, minerals according to the method described by A.O.A.C. (2000) for Ostrich and hen's eggs were carried out in Principal central laboratory, Faculty of Agriculture, Cairo University, Egypt.

3. Nutritional value:-

a. Extraction and determination of amino acids composition of Ostrich and hen's eggs were carried out in Principal central laboratory, Faculty of Agriculture, Cairo University, Egypt. Samples were (Automatic Amino Acid Analyzer – AAA 400 – INGOS Ltd) according to Block *et al.* (1958).

b. Determination of cholesterol for Ostrich and hen's eggs were carried out in Principal central laboratory, Faculty of Agriculture, Cairo University, Egypt. As following:

- Determination of total cholesterol according to Allain *et al.* (1974).
- LDL- cholesterol according to Steinberg (1981).
- HDL-cholesterol according to Lopez - Virella *et al.* (1977).

c. Extraction and determination of Fatty acids according to Farage *et al.* (1986) by GLC (gas liquid chromatography). Fatty acids composition of Ostrich and hen's eggs were carried out in Principal central laboratory, Faculty of Agriculture, Cairo University, Egypt.

4. Microbial Counts:

a. Determination of Total viable count according to Difco Manual (1966).

b. Determination of *Spore - forming* bacteria according to Gould and Hurst (1969).

c. Determination of *Coli form* counts according to Oxoid Manual (1962)

d. Detection of *Listeria monocytogenes* according to Berrang *et al.* (1999).

f. Detection presumptive test for *Salmonella sp*: according to Hargrove *et al.* (1971).

The present study was carried out in Home Economics Department Laboratory, Faculty of Specific Education, Mansoura University, Mansoura, Egypt.

Statistical analysis:

The statistical analysis program was used to analyze data of variance (ANOVA), standard error was done using SPSS version 10 program for windows (SPSS, 2000).

Differences among means were subjected to Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

1. Physical properties and egg quality characteristics:

Data concerning the egg weight components and interior quality characteristics of Ostrich as compared hen's eggs are presented in Table 1. The results in this Table indicated that weight of Ostrich egg was equivalent to 24 of hen's egg and the proportion of yolk and albumen hen's eggs (27.5 and 59.5%) were higher significantly ($P < 0.01$) than the rate in Ostrich eggs (26.38 and 53.68%), respectively. Also, for the ratio of shell Ostrich eggs (19.9%) was higher significantly ($P < 0.01$) than the proportion of shell hen's eggs (12.7%). This may be due to the size of embryo and it's needed. The obtained results for hen's egg are similar to those reported by El-Sharkawy (1991) reported that the egg weight (62.88gm). Yolk, albumen and shell weight (18.32, 38.96 and 5.60 gm) respectively.

The obtained results for Ostrich egg are similar to those reported by DI Meo *et al.* (2003) who reported that the three principal components of Ostrich egg (albumen, yolk and shell) amounted to 57.1, 23.3 and 19.6%, respectively. And Shahin *et al.* (2006). reported that Ostrich eggs are also fully equivalent to chicken eggs in taste and practical properties. They can be cooked in similar ways. Ostrich eggs are impressive by their sheer size and one Ostrich egg (about 1600 gm) is equivalent to 24 chicken eggs. Also they reported that Ostrich egg weight (1600 gm), Yolk, albumen and shell weight (372.80, 913.60 and 313.60gm) respectively. Yolk, albumen and shell percent (23.30, 57.10 and 19.60 %), respectively.

Table 1. Egg weight and percent of egg components and interior quality characteristics of Ostrich eggs compared to hen′s egg.

Characteristics	Ostrich egg	Hen′s egg
Egg weight (gm)	1630	65.3
Yolk weight (gm)	430	18
Yolk (%)**	26.38±0.002 [b]	27.57±0.114 [a]
Albumen weight (gm)	875	39
Albumen (%)**	53.68±0.001 [b]	59.72±0.002 [a]
Shell weight (gm)	325	8.3
Shell (%)**	19.94±0.002 [b]	12.71±0.009 [a]

Triplicates of samples in each group. ** Significant test at $P < 0.01$.

2. Chemical composition of Ostrich eggs compared to hen's eggs:

Data shown in Table (2) indicates that Ostrich eggs have the highest significantly ($P < 0.01$) in moisture contents, whereas Ostrich egg has the lowest significantly ($P < 0.01$) in crude protein, total lipid and ash content compared to hen's egg (9.16, 11.58%),(7.59, 9.21%), (0.81, 0.90%) respectively. These results not agree with those obtained by McNamara and Thesmar (2005), Abu-Salem (2008) of hen′s and Ostrich eggs. However our findings did not agree with that obtained by Sinanoglou *et al.* (2011) for ostrich egg. Mc-Namara and Thesmar (2005) studied the chemical composition of chicken eggs. They found that moisture was the major constituent (75.84%), crude protein, Lipid and carbohydrate (12.58, 9.94, and 0.78%), respectively.

Table 2. Chemical composition of Ostrich eggs compared to hen′s eggs (Wet and dry weight basis).

Components (%)	Ostrich eggs		Hen′s egg	
	W.W	D.W	W.W	D.W
Moisture content**	79.46±0.0004 [a]	-	69.83±0.002	--
Crude Protein**	9.16±0.0002 [b]	44.596	11.58±0.0005 [a]	38.382
Total lipids **	7.59±0.0003 [b]	36.952	9.21±0.0002 [a]	30.527
Ash content**	0.81±0.0004 [b]	3.943	0.90±0.0002 [a]	2.983
Total carbohydrates **	2.98±0.0001 [b]	14.509	8.48±0.0002 [a]	28.108

Total carbohydrates were calculated by differences, W.W: wet weight, D.W: dry weight.
Triplicates of samples in each group, ** Significant test at $P < 0.01$.

3. Nutritional properties of Ostrich eggs and hen's eggs:

3.1. Fatty acids:

Data in Table (3) represented fatty acids as saturated and unsaturated fatty acids, whereas TSFA and TSFA% for Ostrich egg higher than for hen′s egg. On the other hand TUSFA and TUSFA% were higher in hen′s egg rather than in Ostrich egg. But the total fatty acids for Ostrich egg were higher than in hen's egg. These results for the fatty acid content of hen′s egg are in agreement with Mc-Namara and Thesmar (2005). And these result for Ostrich egg nearly to Shahin *et al.* (2006) and Benkhayal *et al.* (2007). Mc-Namara and Thesmar (2005) found that the fatty acids composition of chicken egg yolk per 50gm showed of (C14:0 – 0.02gm), (C16:0 – 1.16gm), (C16:1 – 0.16gm), (C 18:0 – 0.41gm), (C18:1 – 1.82gm), (C18:2 – 0.6gm), (C18:3– 0.02gm), (C20:0 – 0.01gm), (C20:1 – 0.02gm) and (C20:4 – 0.07gm).

Shahin *et al.* (2006) indicated that the fatty acids composition of the Ostrich egg yolk showed the presence of (C12:0 – 0.2%), (C14:0 – 1.0%), (C16:0 – 3.9%), (C16:1 – 33.3%), (C 18:0 – 8.9%), (C18:1 – 37.4%), (C18:2 – 14.6%) and (C18:3 – 0.8%).

Table 3. Saturated and Unsaturated fatty acids composition of Ostrich egg compared to hen's eggs:

Fatty acids	Ostrich egg	Hen's egg
Saturated fatty acids :		
Caprylic (8:0)	1.187	0.220
Capric (10:0)	4.689	0.202
Lauric (12:0)	14.154	0.527
Myristic (14:0)	20.673	2.380
Palmitic (16:0)	18.539	19.840
Margaric (17:0)	2.286	0.210
Stearic (18:0)	1.204	8.534
TSFA	62.732	31.913
TSFA%	66.554%	41.432%
Unsaturated fatty acids :		
Myristoleic (14:1)	4.900	0.010
Palmitoleic (16:1)	2.052	3.487
Oleic (18:1)	9.963	31.920
Linolein (18:2)	12.733	8.542
Linolenic (18:3)	1.396	0.448
Arachidonic (20:4)	0.481	0.705
TUSFA	31.525	45.112
TUSFA%	33.445%	58.568%
TFA	94.257	77.025

TSFA : *Total Saturated fatty acids,* ***TUSFA:*** *Total Unsaturated fatty acids,* ***TFA :*** *Total fatty acids.*

3.2. Cholesterol:

Results in Table (4) show that hen's egg has the highest content of total cholesterol 212 (mg/100/g dry weight), while the lowest value of total cholesterol 25.83 (mg/100/g dry weight) was in Ostrich egg. Also High Density Lipoprotein cholesterol (HDL-c) and Low Density Lipoprotein cholesterol (LDL-c) in mg/100g dry weight determined in both hen′s and Ostrich eggs, whereas hen′s egg also have the highest content registered 9.94 and 14.87, respectively.

These results for the cholesterol content of hen′s egg are in agreement with Agriculture and Agri-Food Canda (1999). Moreover, they found that the content of cholesterol/g of an egg – based on a 59 gm shell egg was 213 mg /g. McNamara and Thesmar (2005) indicated that the content for cholesterol of chicken egg was 423 mg/g.

Table 4. Total cholesterol, HDL-c and LDL-c (mg / 100gm dry weight) of Ostrich eggs compared to hen's egg.

Components / Type of eggs	Total cholesterol	HDL-c	LDL-c
Ostrich egg	25.83	9.94	14.87
Hen's egg	212	40.54	122.04

3. 3. Amino acids:

Data in Table (5) shows that Ostrich egg compared to hen's egg shows that highest content of TAA, TEAA and TNEAA, which are 11.0908, 9.06 g/100g sample in TAA and 7.9692, 6.36 g/100g sample in TEAA and 3.1216, 2.70 g/100g sample in TNEAA. It is also shown that Ostrich egg has the highest content of valine, leucin, phenylalanine, lysine, proline and cystine, but hen's egg has the highest content of glutamic and glycine as compared to Ostrich eggs. These results for the amino acids content of hen′s egg are similar with McNamara and Thesmar (2005). Also, these result for Ostrich egg nearly to Shahin *et al.* (2006).

Mc-Namara and Thesmar (2005) they found that the amounts of the following amino acids of the whole egg (gm/100g) were Theronine (0.59), Valine (0.79), Methionine (0.39), Isoleucine (0.66), Leucine (1.04), Phenylalanine (0.64), Histidine (0.29), Lysine (0.82), Aspartic acid (1.18), Serine (0.91), Glutamic acid (1.54), Proline (0.48), Glycine (0.4), Alanine (0.69), Cystine (0.28), Tyrosine (0.51) and Arginine (0.77).

Table 5. Essential and non essential amino acids content of Ostrich egg compared to hen's eggs (g/100g sample)

Amino acids	Ostrich egg	hen's egg
Essential amino acids :		
Valine	1.0285	0.79
Methionine	0.4662	0.39
Iso- Leucine	0.865	0.66
Leucin	1.5172	1.04
Phenylalanine	0.8068	0.64
Histidine	0.4142	0.29
Lysine	1.1913	0.82
Arginine	0.9085	0.77
Tryptophan	0.7715	0.19
TEAA	7.9692	6.36
EAA%	71.854%	70.20%
Non essential amino acids :		
Glutamic	0.0196	1.54
Proline	1.3312	0.48
Glycine	0.0115	0.40
Cystine	1.7593	0.28
TNEAA	3.1216	2.7
NEAA%	28.14%	29.82%
TAA	11.0908	9.06

TEAA: Total essential amino acids**, TNEAA:** Total non essential amino acids, **NEAA:** Non essential amino acids, **EAA:** essential amino acids, **TAA:** Total amino acids.

3. 4. Vitamins:

The results in Table (6) shown that Ostrich egg contained higher amounts of vitamins: E and A compared to hen's eggs. Their values reached to (1843.97, 0.98 mg/100mg) and (37004.14, 512.14 IU/100 gm) respectively.

These results are disagreement with Agriculture and Agri-Food Canda (1999), McNamara and Thesmar (2005).

3.5. Minerals:

Table (7) shown that the concentration of community minerals zinc (Zn), copper (Cu), iron (Fe), manganese (Mn), magnesium (Mg) and selenium (Se) were high in Ostrich egg rather than in hen′s egg. Which they are (1.64, 5.62, 4.43, 1.79 ppm and 1.09 mg) respectively in Ostrich egg, and (0.56, 0.05, 0.92, 0.02 and 0.01585 ppm) respectively in hen′s egg. Except magnesium (Mg) 0.61 in Ostrich egg and it 6.0 in hen′s egg.

Table 6. Vitamins (IU/ 100g) of Ostrich eggs compared to hen's eggs.

Components / Type of eggs	Vitamin E (mg)	Vitamin A (IU)
Ostrich egg	1843.97	37004.14
Hen′s egg	0.98	512.14

These results are disagreement with Shahin, (2006). These results are agreement with Nadezda and Tigran (2006) found selenium content in Ostrich egg higher than hen′s egg. They added selenium content in eggs of avian species without Selenium supplementation chicken gallus and Ostrich *Struthio camelus* (total 9.11 and 581µg se/kg) respectively.

Table 7. Mineral contents (ppm/100 dry weight) of Ostrich eggs compared to hen′s eggs.

Mineral contents	Type of eggs	
	Ostrich eggs (ppm)	**Hen′s egg (ppm)**
Zinc (Zn)	1.64	0.56
Copper (Cu)	5.62	0.05
Iron (Fe)	4.43	0.92
Manganese (Mn)	1.79	0.02
Magnesium (Mg)	0.61	6.0
Selenium (Se)	1.09*	0.01585

** (mg/100g sample),*

4. Microbiological analysis of Ostrich egg and hen's eggs:

4.1. Some Microbial counts of Ostrich egg compared to hen′s eggs:

Table (8) registered microbial counts in total count and *coliform* group, only in egg shell of Ostrich and hen's eggs and zero count for it in other egg components egg white, egg yolk and mix of white and yolk. But *spore - forming* bacteria zero count in all egg components. These results are not accordance with those reported by Badr (2006) and Shahin *et al.* (2006).

Table 8. Some Microbial counts of Ostrich egg compared to hen′s eggs as raw materials.

Type of eggs / Microbial counts		Ostrich egg				Hen′s egg			
		Egg shell	Egg white	Egg yolk	Mix. of white, yolk	Egg shell	Egg white	Egg yolk	Mix. of white, yolk
T.C^{NS}	**Cfu/g**	3.5×10^{1} ± 0.33	0×10^{1}	0×10^{1}	0×10^{1}	7.8×10^{1} ± 1.86	0×10^{1}	0×10^{1}	0×10^{1}
	Log/g	1.544	0	0	0	2.892	0	0	0
***Spore - forming* bacteria**	**Cfu/g**	0×10^{1}	0×10^{1}	0×10^{1}	0×10^{1}	0×10^{1}	0×10^{1}	0×10^{1}	0×10^{1}
	Log/g	0	0	0	0	0	0	0	0
Coliform* group*	**Cfu/g**	1.3×10^{1} ± 0.88^{b}	0×10^{1}	0×10^{1}	0×10^{1}	243.6×10^{1} ± 13.04^{a}	0×10^{1}	0×10^{1}	0×10^{1}
	Log/g	1.1139	0	0	0	3.386	0	0	0

T.C = Total count, **cfu** = Cell for unit, (0) = Zero count, Triplicates of samples in each group.
NS : Not significant, ** Significant test at $P < 0.01$.

4.2. Some pathogenic bacteria detections of Ostrich egg compared to hen′s eggs:

Table (9) shown that *Salmonella ssp.* and *L. monocytogenes* of Ostrich egg shell and hen's egg shell were detected and appeared clearly. Data revealed that *Salmonella sp.* and *L. monocytogenes* were not found in egg white, egg yolk, mix of white and yolk each of Ostrich egg and hen's egg. These results for *Salmonella sp.* in albumen, yolk egg are agreement with Shahin *et al.* (2006). Also, these results for *Salmonella sp.* in albumen, yolk egg are disagreement with Badr (2006).

Table 9. Detections of some pathogenic bacteria of Ostrich egg compared to hen′s eggs as raw materials.

Type of eggs / Microbial detections	Ostrich egg				Hen's egg			
	Shell	Egg white	Egg yolk	Mix. of white , yolk	Shell	Egg white	Egg yolk	Mix of white, yolk
Salmonella ssp.	++	-	-	-	++	-	-	-
L.monocytogenes	+	-	-	-	+	-	-	-

(++)= Positive, (-) = Negative.

In conclusion, the results of this study indicated that Ostrich eggs had high chemical content than hen's egg in almost parameters. Also microbial examination and detection of some pathogenic were safety level. So, Ostrich eggs are able to use as functional foods.

REFERENCES

A.O.A.C. (2000). Association of Official Analytical Chemists. *Official Method of Analysis*. (17th Ed) Gaithersburg M D.

Abu -Salem, Ferial M. and Abou –Arab, Azza A. (2008): Chemical, microbiological and sensory evaluation of mayonnaise prepared from Ostrich eggs, *Grasas Y Aceites*, **59** (4): 352-360.

Agriculture and Agri-Food Canada(1999): Snapshot of the Canadian egg industry .Annual Report, Canadian Egg Marketing Agency.

Allain, C.C.; Poon, L.S.; Chan, C. S.; Richamand, W. and Fu, P. C. (1974): Enzymatic determination of total serum cholesterol. *Clin. Chem*., **20** (4): 470.

Badr, H. M. (2006): Effect of gamma radiation and cold storage on chemical and organoleptic properties and microbiological status of liquid egg white and yolk. *Food Chemistry*, **97**: 285-293.

Benkhayal, F.A.; Attia, R.S.; El-Mansori, A.A. and Boshahe, S.M. (2007): Separation of lipid fractions of Ostrich and hen eggs produced in jamahiriy. *J. Agric. Sci. Mansoura Univ*., Egypt, **32** (7): 5475-5485.

Berrang, M.E. and Brackett, R. and Beuchat, L. (1999): Growth of *listeria monocytogenes* on fresh vegetables stored under controlled atmosphere. *J. Food Prot*., **52**(10): 702-705.

Block, R.; Durrum, E.L. and Zweig, G. (1958): *Annual of Paper Chromatography and Paper Electrophoresis*.2nd, ed. Academic Press, New York, 75-80.

Brand, Z.; Brand, T.S. and Brown, C.R. (2003): The effect of different combinations of dietary energy and protein on the composition of ostrich eggs. *South African Journal of Animal Science*, **33**(3).

DI Meo, C.; Stanco, G.; Cutrignelli, M.I.; Castaldo, S. and Nizza, A. (2003): Physical and chemical quality of Ostrich eggs during the laying season. *British Poultry Science*, **44**: 386-390.

Difco Manual of Dehydrate Culture Media and Reagents Procedures (1966): Ninth. Ed. Difco Labratories, Detroitt, Michigan, USA.

Duncan, D. B. (1955). Multiple Range and Multiple F Test. *Biometrics*, **11**: 1-42.

EL-Sharkawy, S.I (1991): Diffrences in egg characteristics among some native breeds and some come commercial strains under Egyption conditions. *Egypt. Poult.Sci*., **11**: 397-411.

Farag, R.S.; Hallab, S.A.S.; Hewedi, F.M. and Basyony, A.E (1986): Chemical Evaluation of Rape Seed. *Fette-seifen Anstrichmittel*, **88** (10): 391-397.

Gould, G.W. and Hurst, A. (1969): *The bacterial spores*. Academic press, New York, C. F. M. Sc. Thesis, Faculty of Agric., Ain Shams Univ., Egypt.

Hargrove, F.E.; Mc Donough and Reawer, R.H. (1971): A selective medium and presumptive procedure for detecting of Salmonella in doing products. Dairy products. Dairy products laboratory, Eastern .Utilization Research and development Division, Agriculture, Washing Ton, D.C. 20250. (C.F. M. Sc. Thesis, Faculty of Agric, Mansoura Univ. Abd El-Razek, M.B.) (1982)

Lopez -Virella, M.F.; Stone, S.; Ellis, S. and Collwel, J.A. (1977): Cholesterol determination in high density Lipoproteins separated by three different methods. *Clin. Chem*., **23** (5): p.882.

Mc-Namara, D. J. and Thesmar, H. S. (2005): *Encyclopedia of Human Nutrition*. 2nd Ed. pp86-92 (Egg) Nut. Center, Washington, Dc. USA

Nadezda, A. G. and Tigran, T. P. (2006): Selenium distribution in eggs of avian species. *Comparative Biochemistry and Physiology*, Part B (145): p.384-388.

Oxoid Manual (1962): Pub. By the Oxoid Division, Oxo, South work Bridge. RD., London.

Pearson, D. (1973): *Laboratory Techniques in Food Analysis*. London butter – warths, 27p.

Pearson, D. (1976): *The Chemical Analysis of Foods*. 7 th ed., Churchill Livingstone, London and New York.

Shahin, A. A. M.; Swailam, H. M. and Abou Zeid, A. A. (2006): Effect of Gamma Irradiation on Hygienic quality and chemical characteristics of Dehydrated Ostrich eggs. *International Journal of Agriculture & Biology*, 1560-8530/ 08-2/ p.208-217.

Sinanoglou,V. J. ; Strati, I. F. and Meimaroglou, Sofia M. (2011). Lipid, fatty acid and caroteniod content of edible egg yolks from avian species: A comparative study. *Food Chemistry*, **124**,971-977.

SPSS (200٠). *Statistical Package for Social Science Program*. Version 1٠ for Windows, SPSS Inc, Chicago , IL , USA.

Steinberg, D. (1981): Metabolism of lipoproteins at the cellular level in relation to atherogenesis. In lipoproteins. *Atherosclerosis and Coronary Heart Disease*, **1**(2): p.31-48.

التقييم الكيميائي والميكروبي و التغذوي لبيض النعام مقارنه ببيض الدجاج

عبد الجواد محمد الشواف [١]، أشرف رفعت محمد الزينى [٢] ، ريهام سعد سعد محمد الدسوقي [٢]
قسم تكنولوجيا الأغذية والألبان – معهد الكفاية الإنتاجية – جامعه الزقازيق – مصر [١]
قسم الاقتصاد المنزلي – كليه التربية النوعية – جامعه المنصورة – مصر [٢]

فى هذا البحث تم تقييم بيض النعام من حيث التركيب الكيميائي والتقييم التغذوي والميكروبي ومقارنته ببيض الدجاج.وقد أظهرت النتائج حصول النعام على اكبر وزن للبيضة وأعلى نسبة مئوية للقشرة بينما بيض الدجاج اعلي نسبة مئوية للصفار والبياض ، كما أوضحت النتائج أن بيض النعام مصدر جيد للبروتين (٤٤.٥٩ % وزن جاف) والدهن (٣٧ % وزن جاف) والرماد (٣.٩٧ % وزن جاف) والكربوهيدرات (١٤.٤٤ % وزن جاف). كما وجد التقييم التغذوي للأحماض الدهنية المشبعة الكلية (٦٦.٥٥٤ %) والأحماض الدهنية الغير مشبعه الكلية (٣٣.٤٤٥ %) و الأحماض الدهنية الكلية (٩٥.٢٥٧) ويلاحظ وجود تقارب الى حد كبير لتركيب بيض الدجاج. و الكوليسترول (٢٥.٨٣ ملجم/١٠٠جم وزن جاف) و HDL-c (٩.٩٤ مللجم /١٠٠ جم وزن جاف) و LDL-c (١٤.٨٧ مللجم /١٠٠جم وزن جاف) ويلاحظ انخفاض معدل الكوليسترول بأنواعه فى بيض النعام عن بيض الدجاج . والأحماض الأمينية الأساسية (٧١.٨٥٤%) و فيتامين هـ (١٨٤٣.٩٧ مللجم /١٠٠ جم) و فيتامين أ (٣٧٠٠٤.١٤ وحده دوليه / ١٠٠ جم) ويلاحظ أيضا من النتائج ان نسبه الفيتامينات أعلى في بيض النعام عن بيض الدجاج . كما انه مصدر جيد لبعض العناصر المعدنية مثل الزنك (١.٦٤ جزء فى مليون) و النحاس (٥.٦٢ جزء فى مليون) و الحديد (٤.٤٣ جزء فى مليون) و المنجنيز (١.٧٩ جزء فى مليون) و الماغنيسيوم (٠.٦١ جزء فى مليون) والسلينيوم (١.٠٩ مللجم /١٠٠ جم وزن جاف) . وقد تفوق بيض النعام فى الخصائص الكيمياوية والتغذوية عن بيض الدجاج.

وقد اظهر التقييم الميكروبيولوجي لبيض النعام انه اقل تلوثا ميكروبيا من بيض الدجاج فى كل من القشرة والصفار والبياض والخليط من الصفار والبياض وذلك من حيث العد الكلى والعد لمجموعه القولون والبكتريا المتجرثمة وتم الكشف عن بعض البكتيريا الممرضة مثل ميكروب السالمونيلا و الليستيريا ووجد أنها فى حدود الأمان .و على ذلك نوصى باستخدام بيض النعام في التغذية كغذاء وظيفي .