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COMPARATIVE STUDIES ON NUTRIENTS AND FATTY ACIDS PROFILES OF OSTRICH, DUCK AND CHICKEN EGGS

(With 2 Tables and One Figure)

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دراسة مقارنة على المكونات الغذائية والأحماض الدهنية فى بيض النعام والبط والدجاج

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فى هذه الدراسة تم فحص التركيب الكميائى لبيض النعام للوقوف على مدى ملائمته للإستهلاك كبيض للمائدة. وتمت مقارنته ببيض الدجاج والبط. وكذلك تم مقارنة الأحماض الدهنية لبيض النعام مع بيض الدجاج والبط. ولقد أظهرت النتائج أن المحتوى الغذائى لبيض النعام يماثل نظيره لبيض الدجاج والبط. أما بالنسبة للأحماض الدهنية فقد أظهرت النتائج أن بيض النعام يحتوى على كمية من الأحماض الدهنية الغير مشبعة أحادية النوع أقل من الدجاج والبط وكذلك يحتوى على كمية أكبر من الأحماض الدهنية الغير مشبعة عديدة النوع من المحتوى الموجود فى الدجاج والبط. ومن هنا يتضح أنه لا يوجد سبب لعدم مشاركة بيض النعام لبيض الدجاج والبط كبيض للمائدة.

SUMMARY

Ostrich eggs are studied chemically in the process of investigating their suitability for table consumption. Some comparisons are made between ostrich eggs and those of chicken and duck eggs. The obtained results indicated that the contents of ostrich eggs are similar to those of other chicken and duck eggs in term of proportion of main components and chemical composition. Moreover fatty acid profiles compared between ostrich, chicken and duck eggs revealed that ostrich eggs have reduced portions of monounsaturated fatty acids and increased portion of saturated fatty acids as well as polyunsaturated fatty acids. Although the production of fresh ostrich eggs for consumption is currently not seen as having great potential. There appears to be no reason why those not used as hatching eggs should not be utilized for the human consumption.

Key words: *Eggs, ostrich, duck, chicken*

INTRODUCTION

The aim of breeding of ostriches is the production of leather and meat. Both products are much sought after, the leather because of its quality and structure, the meat because of its dietetically favorable composition combined with sensorial properties rather like beef than like poultry meat.

Ostrich farming is becoming more popular in many countries of the world. Most of the eggs are used for hatching purposes. Infertility of hatching eggs, however, is one of the major problems in ostrich production (Ciliers and Von Schalkwyk, 1994). A limited number of eggs, mainly from females not mated to males or slightly damaged eggs not acceptable for hatching will generally be available for human consumption or other processing or industrial purposes. Avian eggs provide a well balanced source of nutrients for people of all ages (Cook and Briggs, 1977). The concept of egg quality today embraces both the external and internal characteristics of the egg (Belyavin *et al.*, 1987).

Consume of eggs is available in southern Africa and at smaller amounts, in other centers of breeding. Still they are used as culinary specialties rather than as food stuff, although a wide range of recipes for their preparation is available (Reiner *et al.*, 1995).

Ostrich eggs are used for human consumption on a small scale in certain areas in Egypt. They may be cooked whole (cooking time about 75 min.) or scrambled (De Villies, 1981) and one egg is sufficient for 10-12 servings. Only rare information's on ostrich egg composition are at disposal, regarding minerals and trace elements and their significances for chicken development. However, the extent to which ostrich eggs would be suitable for general consumption is unknown. Analysis of proteins and lipids components of the yolk has yet to be carried out for the ostrich egg (Deeming, 1993). So, the present investigation deals mainly with proteins, fat content and fatty acids profiles of ostrich eggs in comparison with duck and chicken eggs.

MATERIALS and METHODS

A total of thirty non-fertile eggs, ten from each of ostrich, duck and chicken eggs were collected from different breeding farms in Egypt. Chemical analysis of eggs contents was done according to the methods recommended by AOAC (1980). The analysis was done for albumin and yolk (mixed). Dry matter content was obtained after drying at 103 ^{o}C in a dryer. Crude protein was calculated from total nitrogen extracted by Kjeldhal's procedure. Fat was extracted with diethyl ether and determined gravimetrically. Ash content was determined following muffle furnace combustion at 600 °C for 18 hr.

For the analysis of the fatty acids, the fats needed were extracted from the samples by acid break down. Analysis was done in the form of methyl-esters into which the fatty acids were converted by the method recommended by Ronald *et al.*, (1991).

Gas chromatography conditions for the analysis of fatty acids profiles were:

* Carrier gas:	Helium	
* Flow rate:	1.9 ml/min.	
* Injector temp.:	250 °C	
* Column:	ZB-wax 30 m X0.25mmX0.25 um	
* Oven temp.:	Initial temp. :	50 °C
	Initial time:	2 min.
	Rate:	10 °C / min.
	Final temp.:	250 °C
* Detector:	Type:	FID
	Temp.:	300 °C

Results were presented as mean, minimum & maximum and the comparison was done between each of ostrich, duck and chicken eggs.

RESULTS

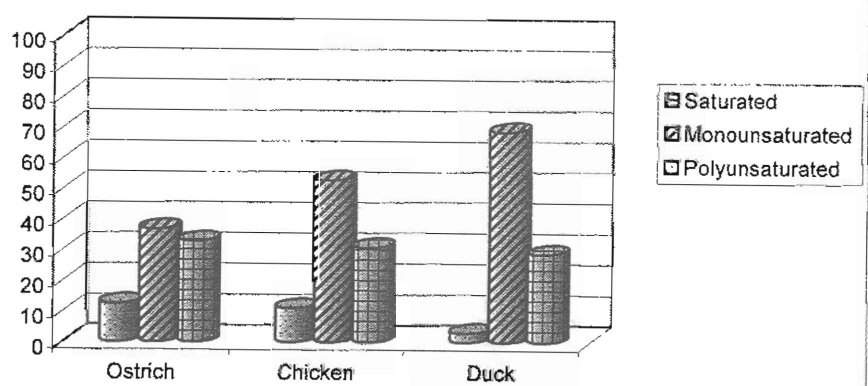
Table 1: Proximate composition of the examined ostrich, chicken and duck eggs by % in 100 fresh matter, g/egg. (n=10 for each).

Composition		Ostrich	Chicken	Duck
Moisture	Min	69.67	68.3	63.49
	Max	76.61	74.9	72.54
	Mean	72.25	71.1	70.50
Crude proteins	Min	10.00	10.50	10.25
	Max	16.06	16.12	18.47
	Mean	11.45	12.46	13.89
Crude fat	Min	10.3	10.65	12.86
	Max	12.74	14.87	15.09
	Mean	11.46	12.36	14.74
Ash content	Min	1.00	1.00	0.80
	Max	2.00	1.80	1.84
	Mean	1.31	1.46	1.27

Table 2: Fatty acid composition of the ostrich eggs in comparison with chicken and duck eggs (% in 100 fresh matters) (n= 10).

Types of fatty acid	Ostrich				Chicken	Duck
	Min	Max	Mean	±SE	Mean	Mean
Saturated	17.94	36.89	32.89	1.95	30.77	28.66
C10 : 0	0.12	0.37	0.31	0.02	0.012	0.01
C12 : 0	0.33	0.87	0.58	0.12	0.012	0.01
C14 : 0	1.04	1.63	1.13	0.68	0.45	0.63
C16 : 0	14.34	27.18	25.34	1.42	23.94	22.89
C18 : 0	1.85	5.61	4.82	2.01	6.30	5.09
C20 : 0	0.18	0.71	0.41	0.33	0.012	0.01
C22 : 0	0.08	0.52	0.30	0.45	0.03	0.02
Monounsaturated	32.89	41.54	36.79	2.54	52.77	68.51
C14 : 1	1.34	2.54	1.79	1.92	1.56	3.78
C16 : 1	8.67	10.39	9.03	0.32	5.16	5.40
C18 : 1	22.24	26.87	24.93	0.85	45.50	58.30
C20 : 1	0.46	1.19	0.68	1.20	0.46	0.85
C22 : 1	0.18	0.64	0.36	0.54	0.09	0.18
Polyunsaturated	9.22	16.84	12.58	1.34	11.04	3.00
C18 : 2	7.80	13.3	9.66	1.05	8.54	2.12
C18 : 3	1.42	3.54	2.92	0.58	2.50	0.88

Fig. (1) Fatty acid composition of the ostrich eggs in comparison with chicken and duck eggs



DISCUSSION

The proximate composition of the whole egg of the different species is comparable in (Table 1, and Fig. 1). Duck eggs contain less water and more fat than that of ostrich and chicken eggs, probably because of the greater heat requirement of the developing embryo (Romanoff and Romanoff, 1949). The fat content of ostrich eggs tends to be lower than that of chicken and ducks eggs. At present the average consumer puts increasing emphasis on the health aspects of food so the lower fat content is valuable tool in marketing strategies to introduce ostrich eggs as a food for the developed countries. Deeming (1993) describes no significant differences in the gross composition between ostrich, chicken and duck eggs.

Analysis of fatty acids detected from C10 to C22 bodies. Fatty acids with longer chains were combined as "else". The most frequently detected fatty acid was palmitic acid (C16: 0). It shared a part of 25.34, 23.94, 22.89% of the fatty acids in ostrich, chicken and duck eggs respectively. With 24.93, 45.50, and 58.3% C18: 1 (oleic acid) was second frequent fatty acid in the whole ostrich, chicken and duck eggs respectively. Saturated fatty acids had a share in total fatty acids of 32.89, 30.77 and 28.66%. Monounsaturated fatty acids had a share of 36.79, 52.77 and 68.51% and polyunsaturated fatty acids of 12.58, 11.04 and 3.00% for ostrich, chicken and duck eggs respectively.

Fatty acid profiles varied clearly from those of poultry species (Decker and Cantor, 1992). Portions of fatty acids were 3% higher in the ostrich eggs. The same is regarded to polyunsaturated fatty acids. Ostrich eggs showed about 1% higher values compared with that of chicken eggs and 8% higher values compared with duck eggs. On the other hand, monounsaturated fatty acids showed an obesity direction. 30% of the ostrich eggs contained the lowest portions, followed by the chicken eggs 16% higher values than ostrich eggs, and the duck eggs had the highest values.

Greatest agreement in fatty acid portion between ostrich, chicken and duck eggs could be found in linolic acid (C18: 2), differences appeared in myristic acid (C14: 0), oleic acid (C18: 1) and linolenic acid (C18:3). Fatty acids profiles in poultry depend on food composition, age, laying performance and breed, so values for fatty acids may vary between different investigations in a not significant manner (Terens *et al.*, 1994) and leading to differences in comparing them.

CONCLUSION

From the available information there is no reason why the ostrich eggs cannot be regarded as an acceptable nutritive product for human consumption. Whilst the uniqueness of the ostrich egg may be exploited as a marketing strategy to sell the limited number of surplus hatching eggs that are currently available at a premium price, it seems unlikely in the near future that ostriches will be kept for fresh table egg production. In the meantime, the fresh ostrich eggs which are available may be marketed as an exotic product or possibly after further research of their nutritional values, as a health product, processing of the eggs and storage stability. Studies of eggs processing are important because the large mass of ostrich egg necessitates the development of methods for the production of smaller portions. Investigations of its organoleptic characteristics, details of which are absent from the literature, would be desirable.

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