Comparison some native fowls (Chicken, Mallard Ducks Quail and Turkey) in components and chemical composition of the eggs in Iraq

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Abstract

A total of 400 eggs of some native fowls, 100 eggs of native chickens (*Gallus gallus domesticus*) 100 eggs of mallard duck (*Anas platyrhynchos*), 100 eggs of quail (*Coturnix coturnix japonica*) and 100 eggs of turkey (*Meleagris gallopavo*) were freshly laid collected from different traditional poultry farms in Baghdad city, Iraq during the period from January 9th 2015 to December 11th of 2016, to determined egg components percentages and chemical composition which included protein, lipids and ash percentages, also lipid profile were determined. Results showed that significant differences ($P<0.05$) were appeared in egg components percentages and some chemical composition values due to fowl species and yolk had high percentages of protein, lipid, cholesterol and low density lipoproteins in mallard duck and turkey eggs compared with chicken and quail eggs.

Keywords: Native fowls, Native chicken, Mallard duck, Quail, Turkey, Egg components, Chemical composition, Iraq.

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مقارنة بعض الدواجن المحلية (الدجاج وبط الملارد والسمان والديك الرومي) في المكونات الداخلية والتركيب الكيميائي للبيض في العراق

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الخلاصة

تم جمع 400 بيضة من بعض الدواجن المحلية والتي شملت 100 بيضة من الدجاج المحلي *Gallus gallus domesticus* و100 بيضة من بيض بط الملارد *Anas platyrhynchos* و100 بيضة من السمان *Coturnix coturnix japonica* و100 بيضة من الديك الرومي *Meleagris gallopavo* وتم الجمع للبيض وهو طازج من عدة حقول صغيرة لتربية هذه الدواجن في بغداد خلال المدة من 9 كانون الثاني 2015 ولغاية 11 كانون الأول 2016 لتقدير نسب المكونات الداخلية والتركيب الكيميائي الذي شمل نسب البروتين والدهون والرماد بالإضافة إلى المكونات الدهنية. اظهرت النتائج وجود فروق معنوية ($P<0.05$) في نسب مكونات البيضة باختلاف انواع الدواجن وان صفار بيض بط الملارد والديك الرومي متفوق في محتواه من البروتين والدهون والكولسترول والبروتينات الدهنية واطئة الكثافة مقارنة ببيض الدجاج السمان.

الكلمات المفتاحية: الدواجن المحلية، الدجاج الحلي، بط الملارد، السمان، الديك الرومي، مكونات البيضة، التركيب الكيميائي، العراق.

Introduction

Fowls or poultry are valuable domesticated birds reared by humans for the eggs they produce and their meat (1). These birds are very important as a source of animal protein for human diets which includes chickens, quails, turkeys, ducks and geese. Poultry were known in ancient China and Egypt and they had already achieved considerable status at that time. The use of meat and also eggs as well as feathers and downs goes back to very early times in the history. Nowadays production and consuming eggs were rises more than 50 million tons of fowl eggs were produced

during 2012 (2, 3). World meat production is expected to increase 1.1% (3.3 million metric tons (MMT)) to reach 311.8 MMT in 2014. Most of the production increases are predicted to be in developing countries, which is also the source of increasing demand (4). Eggs belong to the food with high nutritional quality. People eat eggs for its high nutritional value because of the optimal composition of essential amino acids and the favorable composition of fatty acids with a high percentage of polyunsaturated fatty acids and a favorable ratio of omega 6 to omega 3 fatty acids. It is economical, and quick and easy to prepare and serve (5, 6). The utilization of fowl eggs for processing, also eggs pidan and balut has a long tradition in some Asian countries centuries (7, 8). Fowls egg is one of most complex and highly differentiated reproductive cell, birds egg diverge widely in shape, volume, weight and the amount of yolk and albumen material due to genetic factors; species, breed and strain and non-genetic factors; nutrition, diseases and season (5, 9). Although chicken eggs are currently most commonly eaten by humans, the eggs from other birds are also used for daily consumption. For example Japanese quail eggs are gaining popularity in Europe and America, ostrich eggs in South Africa (10). In Iraq, chicken egg were the most tradition as table egg consumption. Ducks, geese, turkey and quails were in the second category. Since year 2000, a new trend in table egg consumption were appeared through introducing a new poultry species for egg and meat production like ostrich, pheasants, partridge and emu). Al-Obaidi and Al-Shadeedi (11) reported that significant differences ($P<0.05$) were appeared in the components of eggs among ostrich, emu and native chicken. Although, ostrich and emu eggs are equivalent to native chicken eggs in chemical composition, so its eggs were acceptable for consumers as table eggs. The aim of this study was to comparison egg component and chemical composition of some native fowls reared in Iraq.

Materials and Methods

- **Egg collection:** Four hundred eggs were collected of some native fowls, 100 eggs of chickens (*Gallus gallus domesticus*) 100 eggs of mallard duck (*Anas platyrhynchos*), 100 eggs of quail (*Coturnix coturnix japonica*) and 100 eggs of turkey (*Meleagris gallopavo*) were freshly laid collected from different traditional poultry farms in Baghdad city, Iraq during the period from January 9th to December 11th of 2015.
- **Egg components:** Egg components percentage (Yolk, Albumen and shell percentages) were determined according to (5) as described by (12), all eggs were weighted using a very sensitive digital Sartorius balance and shells were breaked then the yolk and the albumen were separated and each were weighted then percentages of each component were determined using the equation:

$$\text{Egg component (\%)} = \frac{\text{egg component weight (gm)}}{\text{egg weight (gm)}} \times 100$$

- **Chemical analyses:** The yolk and the albumen both were distributed into three replicates of glass beakers. protein, lipid a contents in albumen and yolk were carried out according to (13), all these measurements were done in triplicates. Ash determined by ashing samples using muffle furnace oven at 600^{o}C for 6hrs. Lipids analysis was conducted on all samples using mixture of chloroform: methanol (1:1) and stirred for 20min using magnetic stirrer for several rinsing times. Protein determined by the method of semi-microkjeldal determination of N% and the values obtained multiplied with 6.25 to calculate protein%. Cholesterol was determined calorimetrically using ethanol extraction and ferric chloride-sulfuric acid detergent according to the methods descried by (14). Low density lipoprotein (LDL) and high density lipoprotein (HDL) were determined using EnzyChrom HDL and LDL commercial Kite. Triglycerides were eluted and determined by silica gel column according to the methods descried by (13).

- **Statistical analysis:** Data were analyzed by using the General Linear Model Procedure of SAS (15). Means were compared by the Duncan's Multiple Range test at 5% probability (16).

Results

Native chicken have an average egg weights (means ±SE), 56.43±0.76gm compared with 78.71±0.77, 10.20 ±0.71 and 84.36 ±0.74gm for mallard duck, quail and turkey respectively, statistical analysis revealed that significant differences (P<0.05) were appeared in egg components percentage (means ±SE), mallard duck egg have the highest percentage of yolk percentage (34.94 ±0.56%) with low percentages of shell (10.89 ±0.28%) and albumen (54.17 ±0.80%) among other studied species, in the same time egg shell were high in quail and turkey eggs (11.75 ±0.31 and 11.77 ±0.30% respectively) when as chicken egg have the highest percentage of albumen (57.13 ±0.84) among other studied species (Table 1).

Table (1) Egg weight and components (%) of some native fowls in Iraq (means ± SE)

Fowl species	Egg weight (gm)	Egg shell (%)	Egg yolk (%)	Eggwhite (%)
Chicken	56.43±0.76c	11.05±0.33b	31.82±0.52c	57.13±0.84a
Mallard duck	78.71±0.77b	10.89±0.28c	34.94 ±0.56a	54.17±0.80d
Quail	10.20 ±0.71d	11.75 ±0.31a	31.58 ±0.53d	56.67±0.86b
Turkey	84.36 ±0.74a	11.77 ±0.30a	32.10 ±0.57b	56.13±0.85c
Significant	*	*	*	*

***Significant (p<0.05)**

Table (2) shows chemical composition of the edible portions of the egg. Statistical analysis revealed that significant differences (P<0.05) were appeared in egg chemical composition (means ±SE), mallard duck egg yolk had the highest percentages of protein and lipids (19.42±0.32 and 34.88±1.36% respectively), in the same time turkey egg albumen had the highest percentage of protein (12.88±0.22%) among the other studied species egg. No statistical differences were appeared in egg ash.

Table (2) Egg chemical composition of some native fowls in Iraq (means ±SE)

	Fowl species	Egg protein (%)	Egg lipids (%)	Egg ash (%)
Yolk	Chicken	17.59±0.34c	32.41±1.33c	1.14±0.11
	Mallard duck	19.42±0.32a	34.88±1.36a	1.23±0.11
	Quail	17.58±0.35c	32.25 ±1.34c	1.21±0.11
	Turkey	18.73±0.32b	33.19±1.36b	1.27±0.12
	Significant	*	*	N.S.
Albumen	Chicken	11.76±0.24c	-	1.02±0.10
	Mallard duck	12.21±0.21b	-	1.10±0.10
	Quail	11.80±0.21c	-	1.05±0.10
	Turkey	12.88±0.22a	-	1.12±0.10
	Significant	*	-	N.S.

*Significant (p<0.05), N.S. no significant differences in traits values.

Table (3) shows egg yolk lipid profile of some native fowls in Iraq, statistical analysis revealed that significant differences (P<0.05) were appeared in cholesterol, HDL and LDL, which were high in mallard duck and turkey compared with other species whereas no differences were appeared in lipid triglycerides among the studied species.

Table (3) Lipid profile of some native fowls in Iraq (means ±SE)

Fowl species	Cholesterol(mg/gm)	HDL (mg/gm)	LDL (mg/gm)	Triglycerides (mg/gm)
Chicken	16±1.76b	77±3.21b	34±1.72b	77±1.58
Mallard duck	26±2.77a	69±3.28c	45±1.76a	78±1.56
Quail	12±1.71c	89±3.14a	31±1.73c	76±1.60
Turkey	25±2.74a	66±3.25c	46±1.77a	78±1.58
Significant	*	*	*	N.S.

*Significant (p<0.05), N.S. no significant differences in traits values.

Discussion

Although chicken eggs are currently most commonly eaten by humans around the world, the eggs from other birds are also used for daily consumption. For example Japanese quail eggs are gaining popularity in Europe and America, ostrich eggs in South Africa (10). In Iraq, egg of ducks, geese, turkey and quails were in the second category as table egg consumption. Al-Obaidi and Al-Shadeedi (8) reported that egg weight of mallard duck ranged from 62.60 to 65.12 gm with an average value 63.44 gm, its volume ranged from 14.84 to 15.30 cm^3 with an average value 15.03 cm^3, in the same time egg specific gravity were high in mallard duck eggs compared with Peking duck eggs, which the average values were 4.22 and 1.45 respectively. Egg weight is expressed in terms of size, egg size mainly influenced by body size, evolutionary status, climate, the amount of available food and some other factors, also there are enormous range in egg size among different species and within the species between individuals. The size of the eggs laid by one individual may differ widely from those laid by another of the same species and breed, egg size influenced by body size, evolutionary status, climate, the amount of available food and some other factors (5, 17). Birds are grouped according to the relative amounts of the yolk and albumen, they fall naturally into two classes. Egg in which the yolk constitutes between 15 to 20% of the total weight (lower percentage of yolk and lipids) belong to the Altricial species class, egg in which the yolk constitutes between 30 to 40% of the total weight (high percentage of yolk and lipids) belong to the Precocial species class. The yolk has the greatest food values, it contains a mixture of proteins, fats and carbohydrates in a watery medium (18), the relatively large yolk assures a fairly advanced stage of development in the young at hatching, and all duck strains and groups belong to this class, newly hatched chicks are fully capable of eating and swimming (7, 19). High content of protein, lipids in mallard duck egg (2, 7) is essential and needed to this strain which still semi-domestic waterfowl for advanced stage of development of chicks at hatching compared with other studied domestic fowls (8, 17). The nutritive value and functional properties of eggs make them an important animal protein source. However, consumption of eggs is often considered as responsible for some health problems due to high cholesterol content leading to coronary heart disease (20). Our results agreed with Bragagnalo and Rodriguez-Amaya (21), whom compared the cholesterol content of Brazilian chicken and quail eggs, and they showed that there was no significant difference in cholesterol level between chicken and quail eggs in yolk. It should be emphasized that selection for cholesterol level in eggs of Japanese quail influences the physical traits of eggs. Nowaczewski (22) reported that eggs obtained from quails selected for low cholesterol content in yolk were characterized by poor quality of shell and albumen. In conclusion, as a result of domestication, mallard duck had significant differences in egg component percentages and some chemical composition values compared native chicken, quail and turkey and this may affect incubation and hatching behavior of their chicks and its nutrition requirements.

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