Pakistan J. Zool., pp 1-11, 2023. DOI: https://dx.doi.org/10.17582/journal.pjz/20220507070529

Review Article

Nutritional Significance and Health Benefits of Quail's Meat and Eggs: An Empirical Review

Muhammad Saeed[1], Farhana Aslam[2], Muhammad Sajjad Khan[2], Asghar Ali Kamboh[3], Zahid Farooq[2], Rifat Ullah Khan[4], Rizwana Sultan[2], Ahmed Ali Moryani[3] and Huayou Chen[1]*

[1]*School of Life Sciences, Jiangsu University, Zhenjiang, 212013, China*
[2]*The Cholistan University of Veterinary and Animal Sciences, Bahawalpur 6300, Pakistan*
[3]*Faculty of Animal Husbandry and Veterinary Science, Sindh Agriculture University, 70060 Tandojam*
[4]*College of Veterinary Sciences, the University of Agriculture, Peshawar, 25130, Pakistan*

Farhana Aslam and Muhammad Saeed contributed equally to this work.

Article Information
Received 07 May 2022
Revised 05 May 2023
Accepted 25 May 2023
Available online 31 July 2023 (early access)

Authors' Contribution
MS and AAK conceived the study. MS suggested the study ideology. FA, ZF and RUK collected the material and wrote the manuscript. RS and AAM helped in manuscript writing and in proof reading, while HC helped in the revision of manuscript.

Key words
***Coturnix coturnix*, Fatty acid, Health benefits, Meat, Nutrition**

ABSTRACT

With increasing population, there has been an increased demand for animal protein sources i.e., meat and eggs. The cost of production for rearing animals is also a big problem of the current era. Thus, the use of small birds like quail is getting attention due to their low feed requirements and rapid growth. Furthermore, the nutritional quality like amino acid, fatty acid, vitamins, minerals, and protein composition of its egg and meat has more benefits than other birds. Despite their small size, quail eggs have three to four times the nutritious value of chicken eggs and are high in vitamins and minerals. The fatty acids such as oleic, linoleic, palmitic, and stearic acid are most prevalent in the meat of quail. Oleic acid exists around 1/3 of the total fatty acids in the quail breast meat and it is 47.7 and 37.1 percent higher than broiler and duck meat, respectively. Quail meat considered good because of its high oleic acid content, which has been linked to a reduced risk of cardiovascular diseases. A number of evidence exist that showed the superiority of quail eggs and meat compared with other poultry species. The present review aimed to cover the study related to quail egg and meat nutritional composition, their nutraceutical importance and suggest ways to capitalize from the information for future purposes.

INTRODUCTION

The quail is a small to medium-sized game bird that looks like a pheasant. There are two species in subcontinent, the rainforest-dwelling black-breasted or rain quail (*Coturnix coromandelica*) and the brown colored Japanese quail (*Coturnix japonica*). These are cultivated for meat or utilized commercially for egg production (Attia *et al*., 2013; Priti and Satish, 2014). While another species found in Europe known as the European quail or common quail (*Coturnix coturnix*) is a grassland species that prefers open terrain with few shrubs and trees, whether in the lowlands or the mountains. Because of habitat changes associated with agricultural expansion, this species became one of the typical farmland breeders (George, 1990; Luqman *et al*., 2021). The common quail was a common species in Europe until the early 1900s, but a moderate population drop had already been noted by the end of the nineteenth century (Glutz von Blotzheim *et al*., 1994). In the 1980s, a significant drop in its' West-European population was noted, and this trend has continued in most European countries (Birdlife International, 2018). The common quail is a protected species in Hungary, with a modest population loss both in Hungary and all over the Europe

* Corresponding author: hyc@ujs.edu.cn
0030-9923/2023/0001-0001 $ 9.00/0

(Szép *et al*., 2012; Németh *et al*., 2014). It is estimated that there are between 74,000 and 90,000 breeding pairs (Hadarics and Zalai, 2008). Common quail studies were primarily conducted in Western Europe (France, Germany, and Spain), and were concerned with its habitat protection, movements, hybridization with Japanese quail (*Coturnix japonica*), or population dispersion (Saint and Guyomarc'h, 1989).

The migration of quail is influenced by seasonal climate changes. The majority of *Coturnix japonica* (also called *Coturnix coturnix japonica*) moved in the winter to various locations of Southeast Asia (Attia *et al*., 2021; Pappas, 2019). Like other birds, quails are homeothermy species that maintain a constant internal body temperature regardless of outside factors (Jeke *et al*., 2018). *Coturnix japonica* are not used for egg and meat production; instead, their eggs and meat possess nutraceutical properties (Lukanov *et al*., 2018) and have been utilized as a laboratory model for about 6 decades (Ali *et al*., 2020; Reda *et al*., 2020). On a global scale, these are also used as festive bird species and are cared by experienced poultry handlers (Lukanov *et al*., 2018). To enhance production performance and improve the quality of meat and eggs, appropriate feed additives have been recommended for inclusion in their meals (Elnesr *et al*., 2019, 2021). A number of reports have demonstrated the health benefits of quail meat and eggs, however, there is a lack of reviews that summarize the overall nutraceutical potential of quail meat and eggs, which can suggest that consumers use these protein-rich products to overcome several health issues as well as reduce the risk of the onset of chronic degenerative diseases (Jeke *et al*., 2018). Thus, the current review has summarized scientific evidence regarding the pharmacological potential, nutritional significance, and nutraceutical benefits of quail meat and eggs to educate the consumers about the health benefits of these quail products.

QUAIL PRODUCTION

Quails are resilient birds that thrive in small cages and require less feed than chickens (Ani *et al*., 2009). Other distinguishing characteristics and advantages of quails over other poultry species include early sexual maturity, the ability to lay eggs as early as 5-6 weeks of age, a short generation interval that allows for many generations in a year (Robbins, 1981; Annon, 1991), a high rate of egg production (Garwood and Diehl, 1987), a high quality of protein, a high biological value, and a low caloric content of the meat and eggs (Haruna *et al*., 1997; Olubamiwa *et al*., 1999).

At 5 weeks, a broiler (meat purpose) quail can be sold. Quails begin laying eggs at about 6 weeks of age and with a life expectancy of 2- 2½ years produces approximately 248-250 eggs every year (Daikwo *et al*., 2014). Adult Japanese quail can weigh up to 250 grams and lay up to 250 eggs each year (Priti and Satish, 2014). Domesticated quails do not brood, so eggs must be incubated under a broody cage or by artificial incubation. According to recent research, oval eggs are most likely the best to choose for incubation to ensure maximum hatchability in quail production. While spherical eggs may not hatch at all and circular eggs may hatch only infrequently (Idahor *et al*., 2015).

NUTRITIVE VALUE AND PHARMACOLOGICAL EFFECTS OF QUAIL'S EGG

Birds egg is a rich source of food, containing all the lipids, minerals, protein, vitamins and growth factors needed for developing embryo, and various defense components to guard against viral and bacterial infection. Furthermore, quail eggs comprise substances with biological activities such as immune enzymes and functional proteins (Nowaczewski *et al*., 2013; Hansen *et al*., 1998) which are recognized for several pharmacological activities like antimicrobial, antioxidant, antiadhesive, antihypertensive, anticancer, nutrient bioavailability, and functional lipids and protease inhibitors (Jeke *et al*., 2018; Kovacs-nolan *et al*., 2005).

Regular consumption of quail eggs aids in the prevention of various diseases and the strengthening of the immune system. Quail eggs have superior nutritional contents than other eggs and are strong providers of antioxidants, minerals, and vitamins, thus providing much more nourishment than other foods (Tunsaringkarn *et al*., 2013). Quail eggs were reported well for their antimicrobial properties including antibacterial, antifungal, and antivirus as well as anti-inflammatory effects (Jeke *et al*., 2018). Quail eggs also rich in several functional protein families which were regarded for their nutraceutical properties like protease inhibitors *viz*., ovomacroglobulin, ovomucoid, ovoinhibitor, cystatin and lysozyme (Jeke *et al*., 2018). Quail eggs are also well known for their cosmetic properties probably due to high tyrosine content that favor pigmentation and promoting healthier skin colour or vitamin A content that prevent skin dryness, wrinkles and skin aging (nee Kricsfalussy, 1987; Jeke *et al*., 2018).

Quail eggs are an excellent source of nutrition for humans. Many people, particularly in Asian nations, eat quail eggs. Despite their small size, quail eggs have three to four times the nutritional value of chicken eggs and are high in vitamins and minerals (Tunsaringkarn *et al*., 2013).

The quail egg has least ratio of shell as compared to other poultry egg, while it has highest albumen ratio (which is similar to ostrich egg) as compared to other birds egg (Table I).

Table I. Comparison of quail egg parts with other avian species (Kozuszek *et al.*, 2009; Horbañczuk, 2002).

Species name	Eggs white (g)	% of eggs mass		
		Shell	Albumen	Yolk
Turkey	85	11.8	55.9	32.3
Ostrich	1580	19.8	59.8	20.4
Duck	80	12.5	52.9	35.6
Pheasant	32.8	8.9	58.1	33.0
Guinea fowl	40	12.6	52.3	35.1
Chicken	58	12.3	55.8	31.9
Goose	200	12.4	52.5	35.1
Quail	11.3	7.4	59.7	32.7

Most essential amino acids (EAA) in quail egg white includes lysine (790.0 mg/100g), leucine (1139.0 mg/100g) and valine (869.5 mg/100g). Leucine (valine and isoleucine) is a branched chain amino acid and its level is recognized higher (about 2-3%) in quail eggs as compared to other poultry eggs (Ali and Abd El-Aziz, 2019). It is a useful functional amino acid that accounts for 60-70 percent of the human body protein. It also plays major role in blood sugar level management, which sustains an insulin-glucose balance (Tunsaringkarn *et al.*, 2013). For the treatment and prevention of type 2 diabetes it has been presented as a pharmaconutrient (van Loon, 2012). Valine is essential for tissue growth and repair, maintaining the body's nitrogen balance and muscle metabolism. Valine also aids in the regulation of blood sugar and energy levels (Vital Health Zone, 2007a). While lysine is essential for growth and bone development in children, it also aids in calcium absorption and the maintenance of a proper nitrogen balance in the body, as well as the maintenance of lean body mass. Lysine is also required to produce antibodies, hormones, enzymes, collagen creation, and tissue healing (Vital Health Zone, 2007b). Aspartic acid and alanine are the most common non-essential amino acids (NEFA) found in quail eggs, with their level being 15.9% and 8.6% higher, respectively than chicken eggs (Ali and Abd El-Aziz, 2019). Aspartic acid is essential for energy production, whereas alanine is essential for maintaining level of glucose in body by assisting the body in converting glucose into energy. In liver alanine also helps in detoxification of poisons (Vital Health Zone, 2007c). Alanine are beneficial to animal health, and both EAA and NEAA should be included in the classic "ideal protein" concept of stable diets to promote animal and human's health and enhance protein mass (Wu, 2010). The percent amino acid contents of quail eggs were shown in Table II.

Table II. Amino acids contents (%) of the quail egg (Genchev, 2012).

Amino acid	Albumen and yolk		Albumen		Yolk	
	MG	Ph	MG	Ph	MG	Ph
Arginine	0.48	0.49	0.35	6.72	0.71	0.7
Methionine	0.43	0.44	0.38	0.40	0.52	0.51
Serine	0.92	0.94	0.74	0.78	1.26	1.23
Lysine	1.17	1.18	1.03	0.37	1.40	1.37
Histidine	0.48	0.48	0.37	1.07	0.65	0.64
Proline	0.64	0.64	0.55	0.58	0.77	0.75
Threonine	0.73	0.73	0.64	0.67	0.86	0.84
Glycine	0.44	0.44	0.43	0.45	0.43	0.42
Leucine	1.23	1.24	1.10	1.15	1.45	1.42
Cysteine	0.55	0.57	0.63	0.66	0.41	0.4
Isoleucine	0.65	0.65	0.55	0.58	0.81	0.79
Phenylalanine	0.76	0.78	0.78	0.82	0.72	0.71
Alanine	0.72	0.72	0.68	0.71	0.77	0.75
Valine	0.89	0.90	0.84	0.88	0.97	0.94
Glutamic acid	2.02	2.06	1.98	2.08	2.10	2.05
Thyroxine	0.51	0.52	0.47	0.49	0.57	0.56
Aspartic acid	1.29	1.3	1.21	1.26	1.42	1.38
$\sum$ NAA	6.99	7.07	6.31	6.62	8.01	7.92
$\sum$ EAA	6.92	7.01	6.42	6.72	7.71	7.54
EAA: NAA	1:0.99	1:0.99	1:1.017	1:1.015	1:0.96	1:0.95

MG, Manchurian Golden Japanese quail; Ph, Pharaoh Japanese quail; EAA, essential amino acid; NAA, nonessential amino acid ratio.

The most abundant non-essential fatty acids (NEFA) in egg yolk are oleic acid (8.84 g/100g), but palmitic acid (5.13 g/100g) and stearic acid (2.03 g/100g) also found. Palmitic acid and oleic acid were found 2.1% and 4.6% higher respectively in quail eggs as compared to chicken eggs (Ali and Abd El-Aziz, 2019). Linoleic acid is necessary for optimum health and influences body composition. Mild skin scaling and hair loss are caused by a linoleate-deficient diet (Cunnane and Anderson, 1997). Monounsaturated fatty acid (MUFA) and poly-unsaturated fatty acid (PUFA) were also observed 5.7% and 1.8% higher in quail eggs than chicken eggs (Ali and Abd El-Aziz, 2019). Omega-6 and omega-3 are PUFA that were linked with several health effects including maintenance of blood pressure, inflammation and serum lipids. PUFA also known to regulate metabolism, stimulate hair and skin growth, maintain the reproductive system, and maintain health of bone (Remans *et al.*, 2004; Watkins *et al.*, 2001). While, MUFA intake is been linked with protective effect against coronary heart disease by modulating total and LDL-cholesterol (Ooi *et al.*, 2015). In quail eggs total NEFA was found to be 4.6 times higher than total EFA. The quail eggs contained modest levels of trans fatty acids, which were harmful to human health. Consumption of trans fat boosts low-density lipoprotein (LDL) cholesterol. Trans-fat content is listed on nutrition labels by food producers in several countries along with United States. They suggested limiting trans fat consumption to less than 0.5 grams per serving. DGA (Dietary Guidelines for Americans) recommend that people should consume as little trans-fat as feasible (McGuire *et al.*, 2011). The fatty acid profile of quail eggs is presented in Table III.

Table III. Fatty acid content (percent of lipid fraction) of quail egg (Genchev, 2012).

Fatty acid	Phospholipids		Triglycerides	
	MG	Ph	MG	Ph
∑ n-3	1.4	1.2	0.2	0.2
∑ n-6	21.8	22.6	9.6	9.3
∑ MUFA	33.0	30.7	52.9	51.3
∑ PUFA	23.1	23.8	10.0	9.9
∑ SFA	43.9	45.4	36.9	38.8
n-6/n-3	15.9	18.9	41.6	42.5
PUFA/SFA	0.53	0.53	0.28	0.26

MG, Manchurian Golden Japanese quail; Ph, Pharaoh Japanese quail; PUFA, polyunsaturated fatty acid; SFA, saturated fatty acid; MUFA, monounsaturated fatty acid; PUFA/SFA, polyunsaturated/saturated ratio.

In eggs, most fat soluble vitamins were vitamin E (59.20 µg/g), which was substantially greater than vitamins A (7.17 µg/g) and D (0.011 µg/g) (Tungjaroenchai *et al.*, 2013) as shown in Table IV. Vitamin E is potent antioxidant under in in vitro and biological systems. It is available in eight distinct forms (isomers): alpha-, beta-, gamma-, and delta-tocopherol; and alpha-, beta-, gamma-, and delta-tocotrienol, with alpha- being the most active in humans. Because of its antioxidant characteristics, it has been advocated for the treatment of a variety of health disorders. Quail eggs were observed for 11.3% higher level of vitamin E than chicken eggs (Ali and Abd El-Aziz, 2019). Moreover, quail eggs also have a greater amounts of vitamin B2 (56.6%) and B6 (8.3%) than chicken eggs (Ali and Abd El-Aziz, 2019). The supplementation of vitamin E was connected to a 24% lesser risk of cardiovascular disease and a 26% lower risk of serious cardiac events (Lee *et al.*, 2005). Eye disorders (Jacques *et al.*, 2005; Leske *et al.*, 1998), heart illness (Traber, 2007; Glynn *et al.*, 2007), cancer (Lee *et al.*, 2005; Weitberg and Corvese, 1997) and cognitive failure (Kang *et al.*, 2006; Morris *et al.*, 2002) may all be affected by vitamin E. Although human data is inconsistent, evidence suggests that using high-dose vitamin E supplements on a regular basis may increase the risk of mortality from any cause (Bjelakovic *et al.*, 2007; Miller *et al.*, 2005).

Table IV. Vitamin content of quail's egg (Tunsaringkarn *et al.*, 2013).

Vitamins	Concentrations
E (µg/g)	59.20
D (µg/g)	0.011
A (µg/g)	7.17
Niacin-B3 (mg/100g WLE*)	0.10
Riboflavin-B2 (mg/100g WLE*)	0.851
Thiamine- B1 (mg/100g WLE*)	0.12

Whole Liquid Egg-WLE*

Table V. Mineral content of quail egg (Genchev, 2012).

Mineral (mg/l00g)	Albumen	Yolk
Fe	0.45	39.39
P	100	4880
Cu	0.45	0.62
Zn	1.37	18.98
Mg	83.24	111.41
Ca	85	1490

Iron, copper and magnesium are the important trace minerals found in entire eggs. Copper and magnesium levels found higher in yolk of egg like many other minerals (Table V). The ratio of iron, copper and magnesium was found 5.6%, 16.9% and 14.3% higher respectively in quail eggs as compared to chicken eggs (Ali and Abd El-Aziz, 2019). Iron performs numerous tasks in body and necessary for keeping a strong immune system, which is required for plasma to function properly. In the transfer of oxygen, iron acts as hemoglobin; lack of iron is frequent among athletes, particularly high distance runners, and can result in weariness. Anemia (iron deficiency) is the world's common nutritional disorder, impacting at least 500 million individuals (Soetan *et al.*, 2010). Copper is vital component of many lignin-biosynthetic enzymes and redox in the body, while magnesium activate many enzymes as a major component of chlorophylls (Soetan *et al*., 2010).

NUTRITIVE VALUE AND PHARMACOLOGICAL EFFECTS OF QUAIL'S MEAT

Quail meat is well-liked by people in many nations. In Europe, commercial quail production is mostly for meat, but in Japan, it is for eggs and meat (Minvielle *et al*., 1999). In China, meat-type quails are marketed at about 4 weeks of age (Minvielle *et al*., 1999). In Egypt, meat-type quail production is very high than egg-type quail production (Hassan *et al*., 2021). Consumption of quail meat has linked with several health effects thus regarded as functional foods in the literature (Jeke *et al*., 2018).

Table VI. Amino acid contents of meat of quail.

Amino acids gram/100g protein	Quail breast meats		
	Wild	**6 weeks**	**8 months**
Tryptophan	0.18	1.07	1.02
Valine	5.40	5.20	5.12
Lysine	8.78	8.99	8.93
Leucine	8.22	8.15	8.13
Methionine	2.64	2.69	2.64
Phenylalanine	4.63	4.68	4.72
Isoleucine	4.98	5.10	4.99
Threonine	4.59	4.58	4.50
Total essential amino acids	39.30	37.09	36.05
Glysine	4.85	4.80	5.04
Arginine	6.60	6.69	6.87
Proline	3.95	4.03	4.35
Aspartic acid	9.90	10	9.93
Glutamic acid	15.40	14.15	14.31
Cysteine	1.08	1.34	1.50
Serine	3.98	3.81	4.05
Tyrosine	3.62	3.49	3.74
Alanine	6.80	6.15	6.63
Histidine	4.40	4.45	3.53
Total non-essential amino acids	57.88	58.91	59.95
Total amino acids	96.88	95.91	96.01
E/NE ratio	0.68	0.63	0.60

Unbalanced dietary protein is thought to be the starting point for activation of enzymes involved in amino acid catabolism. Protein deficiency increases catabolism of tissue fat and protein from the poultry carcass, whereas extra protein increases oxidation of amino acids as a source of energy and nitrogen excretion from the body. The quail meat provides more energy as compared to chicken meat (192 vs. 187kcal) as it contains 155.8% more fat as compared to chicken meat (Mazmanyan, 2023). Quail meat is also have 956.5%, 208.9%, 108%, 100% and 16.2% high in vitamin A, B1, B2, folic acid, and vitamin B12, respectively as compared to chicken meat (Mazmanyan, 2023). Water-soluble vitamins (B vitamins) are not stored in the body thus their daily intake is necessary for optimal health status. These vitamins are coenzymes and vital cofactors in numerous metabolic pathways and also play major role in immune hemostasis (Yoshii *et al*., 2019). Commercial quails meat have 95.91-96.01 g/100g of total amino acids (wild quails: 96.88 g/100g) with 36.05-37.09 g/100g of total essential amino acids (wild quails: 39.30 g/100g) and 58.91-59.95 g/100g of total nonessential amino acids (wild quails: 57.88 g/100g) (Table VI).

Table VII. Fatty acid contents of quail's meat.

Fatty acids	Name	Breast quail meat		
		Wild	**6 months**	**8 months**
C14:0	Myristic acid	0.83	0.78	0.70
C16:0	Palmitic acid	13.47	19.81	15.57
C16:1n9	Palmitoleic acid	3.65	3.85	2.78
C16:1n7	Palmitoleic acid	0.29	0.15	0.27
C16:1n5	Palmitoleic acid	0.24	0.16	0.40
C17:0	Heptadecanoic acid	ND	ND	0.22
C18:0	Stearic acid	5.12	6.27	5.79
C18:1n9	Oleic acid	35.17	35.36	38.99
C18:1n7	Vaccinic acid	35.72	1.90	2.46
C18:1n5	6-octadecosanoic acid	0.56	ND	ND
C18: 2n6	Linoleic acid	ND	26.32	28.85
C18:3n3	Linolenic acid	2.65	2.18	0.93
C20:0	Arachidic acid	0.22	0.36	0.65
C20:1n9	Gondoic acid	0.77	0.73	0.45
C20:4n3	Eicosatrienoic acid	0.38	ND	ND
C20:5n3	Eicosapentanoic acid	0.20	0.97	0.88
C22:0	Behenic acid	0.34	0.60	0.83
Non-identified fatty acids		0.39	0.65	0.00
Total saturated fatty acids		19.98	27.82	23.76
Total unsaturated fatty acid		79.63	71.60	76.01
Total monounsaturated fatty acid		76.40	42.15	44.55
Total polyunsaturated fatty acid		3.32	29.47	30.66
PUFA/SFA ratio		1.16:1	1.06:1	1.29;1

The principal fatty acids found in hens are vaccinic, stearic, oleic and palmitic acids, accounting for 89.48 percent of total lipid content (Table VII). However, factors like breed, sex, age, nutrition, geographical location, climate, and rearing method can all have an impact on fatty acid composition (Franco and Lorenzo, 2013). The findings also found that oleic acid made up more than 1/3 of the lipid content of wild and farmed quail breast flesh. The oil with a high oleic acid content has been linked to a lower risk of cardiovascular disease. The meat's linolenic acid concentration is a valuable source of protein with a very good amino acid profile (Wolaszyn *et al*., 2003).

Quail meat, like most poultry meats, has an acid ratio of 1.35-1.36:1, indicating that it has a high biological value. A daily intake of 2 quails is like 125-130 g pure meat on average, which provides a total of 27-28 g protein, including 11 g essential amino acids, which is equivalent to 40% of human protein needs (Nedkov, 2004). When comparing the fatty acid composition of quail meat to that of other bird species, it can be noted that the lipids of quail meat are 47.7 percent richer in oleic acid (C18:1) than broiler chicken meat and 37.1 percent richer than duck meat (Wolaszyn *et al*., 2003). Quail meat also have 143% and 178.5% high levels of MUFA and PUFA, respectively as compared to chicken meat (Mazmanyan, 2023).

Table VIII. Mineral contents of quail's meat.

Minerals (mg/100g)	Breast quail meats		
	Wild	6 Weeks	8 Months
Zn	0.70	0.61	0.49
Cd	0.003	0.005	0.003
Mg	11	13.10	10.62
Fe	9.31	5.93	5.31
Na	17.86	31.30	14.93
Mn	0.094	0.091	0.066
P	56.42	75.75	48.72
Ca	41.12	55.47	42.61

The discrepancies in mineral content could be attributed to the birds age or diet. Calcium content ranged from 42.61 to 55.47 mg/100g, sodium (14.93 to 31.30 mg/100g), phosphorus (48.72 to 75.75 mg/100g), magnesium (10.62 to 13.10 mg/100g), iron (5.31 to 5.93 mg/100g), manganese (0.07 to 0.09 mg/100g), zinc (0.49 to 061 mg/100g), and cadmium (0.003 to 0.005 mg/100g) were recognized in 6 to 8 weeks old quail meat (Table VIII). During comparing quails meat with chicken breast it was observed that quail meat have high contents of copper (+838.9%), iron (+248.2%), Zinc (+124.1%) and phosphorus (+11.8%) as compared to chicken meat (Mazmanyan, 2023). In the body zinc involved in over 100 different chemical reactions. Some of these responses aid in construction of body and maintenance of deoxyribonucleic acid (DNA). It is required for the repair and development of tissues all over the body (Bhowmik *et al*., 2010). This critical ingredient is required for the formation of connective tissue such as ligaments and tendons. Zinc is required for the growth of teeth, bones, nails, skin, and hair. Zinc enrichment would help to reduce mortality due to pneumonia and diarrhoea in children (Yakoob *et al*., 2011; Haider and Bhutta, 2009). The earlier study demonstrated its biological part in proliferation, apoptosis and homeostasis, as well as its role in long-lasting illnesses and immunity (Chasapis *et al*., 2012). Likewise, iron is a major component of cytochromes and play crucial role in electron transport, as well as in activation mechanism of various cellular enzymes; whereas phosphorus is regarded as a key element of adenosine triphosphate phospholipids and nucleic acids (Soetan *et al*., 2010). Breast meat of wild quail had higher amounts of iron, magnesium, and zinc than meat of farmed quail, and roughly same levels of Mg, Cd, and Ca as 8-months (old) quail meat, with intermediate levels of P and Na (Genchev *et al*., 2008).

CONCLUSION

There were numerous nutritional benefits of eggs of quail, the most of which were rich sources of fat, minerals (zinc, iron and nitrogen), vitamin E, and protein. Wild quail meat had higher levels of zinc, Fe, and protein when it compared to farmed meat of quail. Quail meats are considered a strong supply of essential amino acids, and the fatty acid profile is primarily composed of stearic, oleic, palmitic, and linoleic acid. These nutrients were observed for several nutraceutical effects. Thus, we should teach or transfer knowledge to public about the nutritional aids of eggs and meat of quail as the best nutritional foods, which may be an alternate to resolve the difficulties of people in developing countries lacking some or all nutritive nutrients required for human fitness and may be good potential to resolve the World Food Problem.

Funding

All the authors of this manuscript are very grateful to National Key Research and Development Program, China (2021YFC2103004).

Statement of conflict of interest

The authors have declared no conflict of interest.

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