STUDY ON THE NUTRITIONAL VALUE OF THE POULTRY MEAT ISSUED FROM DIFFERENT FARMING SYSTEM

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Abstract

The present study focuses on the fatty acids profile and amino acids profile of domestic animals meat from different intensive, free-range and organic farming systems. Broiler chicken meat contains unsaturated fatty acids such as oleic acid and linoleic acid, which are considered to be beneficial to health (h/H 2.52-3.16). Turkey meat was characterized by a high proportion of unsaturated fatty acids (MUFA + PUFA ~68%). The fatty acid profile varies according to the different anatomical segments of the pork, with the muscle showing the highest levels of SFA. Beef showed an n3/n6 ratio varying between 1.9 and 2.6. The importance of proper management of animal diets to improve meat quality is also emphasized. Meat is the most consumed protein source, rich in essential amino acids, therefore this study can help guide dietary decisions based on consumer health and lifestyle preferences, as well as improve practices in sustainable agriculture.

Key words: *poultry, turkey, beef, pork, nutritional qualities*

INTRODUCTION

Meat represents an essential source of nutrients in the human diet, providing high-quality proteins, lipids, and micronutrients that contribute to overall health. However, not all types of meat are equal in terms of their nutritional value. The factors influencing the quality and composition of meat are varied and include not only the type of animal but also the farming system used. Recent studies suggest that farming methods—whether conventional, organic, or free-range—can significantly affect the nutritional profile of meat, including its content of fatty acids, vitamins, and minerals. This variability necessitates a detailed examination of how these farming systems impact not only the sensory quality of meat but also its nutritional benefits [1].

Meat has been perceived not only as an important source of nutrients, such as proteins, lipids, and minerals, but also as a food capable of providing bioactive compounds essential for various metabolic functions, which are fundamental for maintaining optimal human health [2].

Poultry meat, particularly broiler chicken meat, is the most widely produced and consumed globally, followed by pork and beef. Poultry production has grown the fastest, due to lower costs and a strong global consumer preference. Pork is a staple food, especially in Asia, while beef production has seen slower growth, attributed to higher costs and its environmental impact [3].

The quality of broiler chicken meat is influenced by several factors, including the farming system [4,5], age, and genotype. Sensory quality indicators of meat (color, cooking losses, and tenderness) and its composition (intramuscular fat profile and

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fatty acids) can be affected by these parameters, thus influencing consumer acceptance. The farming system can influence both the amount of fat accumulated and the proportion of fatty acids [6], having a direct impact on the fatty acid profile.

The main purpose of this study is to assess the nutritional quality of poultry meat, specifically broiler chicken, in different farming systems in relation to the feeding practices applied.

In conclusion, the primary objective of this work is to evaluate the impact of the broiler chicken production system (intensive, free-range, and organic) on meat characteristics, with respect to the proximal composition and lipid profile in broiler chicken meat, with a particular focus on chicken breast, which is of the highest interest, making comparisons with meat from other animal species (pork, beef, turkey, goose, duck, lamb, buffalo).

MATERIAL AND METHOD

The systematic review for this study involved using search engines such as Web of Science, Google Scholar, and Science Direct. Articles were selected for research aimed at determining the nutritional value of broiler chicken meat raised in different farming systems and comparing it with other types of meat, including beef, pork, turkey, goose, duck, lamb, and buffalo. The articles used varied in publication date, spanning from the year 2000 to the present, 2024.

Numerous search terms were used, including: meat quality, lipid indices, crude protein, moisture, ash, and crude fat, as well as intensive system, free-range, and organic system.

The inclusion criteria were as follows:

1) Specification of the farming system and feeding practices applied.

2) Data on specific fats, acids, or saturated, monounsaturated, and polyunsaturated fatty acids, measured in grams (g), g/100 g, or as a percentage.

3) Details on the effects of varying amounts of fatty acids, including lipid index calculations.

Relevant information was organized into three tables, addressing chemical composition analysis, fatty acid composition, and lipid index calculations across different meat types. The tables were structured into columns to display meat type, farming system, nutritional values (proteins, lipids, carbohydrates, etc.), and fatty acid profile. Once the tables were completed, the data was analyzed to identify trends and variations between meat types and farming systems.

Significant differences in nutritional profiles based on the farming system were observed, discussed in the context of implications for human health and dietary choices. This method of table construction allowed for a clear and concise presentation of the nutritional values of different types of meat, facilitating an understanding of the impact of farming systems on human health and nutrition.

RESULTS

An overview of the nutritional composition of various types of meat, based on farming system and anatomical region, is presented in Table 1.

The moisture content for broiler chicken ranges from 72.29% (intensive system) to 73.70% (free-range). These values fall within the normal range for poultry meat, suggesting a juicy texture.

The dry matter content in broiler chicken meat is at a minimum of 26.30% in free-range systems and reaches a maximum of 27.71% in intensively raised broilers.

For beef, moisture content ranges between 73.80% and 74.47%, while the dry matter content is notably high (26.20% for the *longissimus lumborum* muscle in the intensive system), indicating a denser meat.

Table 1. Chemical Composition of Various Types of Meat

Meat Type	Rearing System	Anatomical Region	U %	Dry matter%	CP%	CF%	Ash %	Source
Broiler chicken	Intensive	Breast	72.29	n.d.	22.78	1.86	1.12	[7]
	Free range	Breast	73.70		23.70	0.33	1.40	[8]
	Organic	Breast	72.9		22.6	2.66	1.20	[9]
Beef	Intensive	*Longissimus lomborum* Muscle	n.d.	26.20	21.92	2.92	1.08	[10]
	Semi-intensive			25.53	21.83	1,74	1.07	
Pork	Intensiv	-	75.55	n.d.	22.00	1.45	0.99	[11]
	Free-range		74.79		22.76	1.43	1.03	
Turkey	Extensive	Breast	73.46		25.31	1.04	1.07	[12]
	Free range	Breast	n.d	25.93	23.71	1.14	1.05	[13]
Goose	Free range	Breast	n.d.	26.61	22.46	3.72	2.50	[14]
Duck	Cage	Breast	73.83	n.d.	23.53	2.30	n.d.	[15]
	Floor	Breast	74.43		23.58	1.86		
Lamb	Extensive (Grazing)	-	73.30		21.97	2.41	0.90	[16]
	Semi-intensive		73.93		21.24	2.05	0.85	
	Intensive (boxes)		73.04		21.57	2.64	1.01	
Buffalo	Intensive+ Corn Silage	*Longissimus thoracis* Muscle	n.d.	22.66	20.43	n.d.	1.05	[17]
	Intensiv +Pasture Hay			23.41	21.16		1.06	
	Extensive (Grazing)			23.06	21.35		1.14	

* U: Moisture (%), CP: Crude Protein (%), CF: Crude Fat (%), n.d.: Not determined

Pork raised in an intensive system has the highest moisture content at 75.55%, a characteristic often associated with pork, which tends to be fattier and juicier. In contrast, intensively raised broiler chicken has the lowest moisture content among the meats analyzed, with a level 3.26% lower than that of pork.

Turkey and goose meat show moisture levels ranging from 73.39% in goose to 74.07% in turkey, generally remaining close to the moisture level of broiler chicken (73.46%).

The crude protein content varies widely, from 20.43% in buffalo meat raised intensively with corn silage to 25.31% in turkey meat from extensive systems. These values reflect a good protein source, essential for a balanced diet.

Free-range broiler chicken has the highest protein content, reaching 23.70%. In contrast, organic and intensively raised broiler chickens have 1.1% and 0.92% less protein, respectively, than free-range broilers. Duck meat shows similar protein levels for both cage-raised and floor-raised ducks, between 23.53% and 23.58%, but there are substantial differences in crude fat and ash content. Cage-raised duck meat has a higher crude fat content of 2.30%, which is 0.44% more than floor-raised duck, while ash content is also higher at 0.34% compared to 0.13% for floor-raised duck, suggesting lower mineral bioavailability in floor-raised ducks.

Intensively raised broiler chicken has a relatively low crude fat content of 1.86%, while goose meat contains 3.72%, and turkey ranges from 1.04% to 1.14%. The higher fat content in goose meat contributes to its richer flavor. In free-range broiler chicken, the fat content in breast meat is as low as 0.33%ly lower value than other systems, highlighting the positive effect of alternative farming systems on reducing fat content. Buffalo meat from extensive systems has similarly low crude fat, with 0.57% in the *Longissimus thoracis* muscle.

Organic broiler chicken has 2.33% more fat than free-range broiler meat and 0.8% more than intensively raised broilers. Beef raised intensively shows 1.18% more fat content than semi-intensively raised beef. Ash content remains below 2% for broiler chicken and pork, which is considered normal. However, goose meat has a higher ash content of 2.50%, suggesting better mineral bioavailability. Among broiler chickens, free-range systems yield the highest ash content at 1.40%.

Free-range systems tend to have slightly higher moisture and lower fat content than intensive systems, suggesting that meat from alternative farming conditions may often be nutritionally richer. Meat from extensively raised animals, such as lamb and buffalo, also tends to show a favorable nutritional profile, with a moisture content of 73.30% for lamb and 76.94% for buffalo. Protein content is also slightly higher in buffalo and lamb from extensive systems, with values of 21.35% and 21.97%, respectively, compared to intensively and semi-intensively raised counterparts.

In terms of fatty acid composition, intensively raised broiler chicken has 32.79% saturated fatty acids (SFA), 30.84% monounsaturated fatty acids (MUFA), and 35.35% polyunsaturated fatty acids (PUFA). This balance, with a slightly higher PUFA content, is beneficial for human health. Another study found lower PUFA values of 24.37% in intensively raised meat, indicating a less balanced fatty acid profile. The brof organic broiler chicken showed a high PUFA content of 32.80% (Table 2), further supporting the benefits of organic farming systems.

Table 2. Fatty Acid Composition of Different Types of Meat

Meat Type	Rearing System	Anatomical Region	SFA%	MUFA%	PUFA%	Source
Broiler chicken	Intensive	Breast	32.79	30.84	35.35	[7]
			31.56	44.06	24.37	[8]
	Free- range	Breast	31.50	41.30	27.20	
	Organic	Breast	32.40	34.80	32.80	
Beef	Extensive	*Longissimus dorsi* Muscle	56.00	37.80	5.30	[18]
	Intensive	*Longissimus lomborum* Muscle	48.65	47.04	4.30	[10]
	Semi-intensive		51.20	43.38	5.41	
Pork	Intensive	Leg	44.57	40.51	14.92	[19]
		Longissimus dorsi Muscle	45.76	39.18	15.06	
		Psoas major Muscle	50.70	31.09	18.20	
Turkey	Extensive	Breast	30.78	29.32	36.60	[12]
	Free range	Breast	38.04	34.62	26.54	[13]
Goose	Free Range	Breast	31.09	46.26	20.44	[14]
Lamb	Extensiv (Grazing)	-	47.91	41.99	10.23	[16]
	Semi-intensive		49.32	40.60	10.06	
	Intensive (boxes)		50.67	41.70	7.72	
Buffalo	Intensive+ Corn Silage	*Longissimus thoracis* Muscle	45.01%	35.15	18.84	[17]
	Intensive + Pasture Hay		43.20	36.52	20.28	
	Grazing		41.55	37.42	21.03	

*SFA: Saturated Fatty Acids, MUFA: Monounsaturated Fatty Acids, PUFA: Polyunsaturated Fatty Acids

The *Longissimus dorsi* muscle from beef raised in an extensive system has an SFA content of 56.00%, which could be a characteristic of beef, which is often richer in saturated fats. The Longissimus lomborum muscle has an SFA content of 48.65% and MUFA of 47.04%. The lowest values of polyunsaturated fatty acids (PUFA) were recorded in beef obtained from the intensive system, with only 4.30% PUFA, followed by the extensive system at 5.30%, and the semi-intensive system at 5.41%.

The fat content in pork meat is generally rich in SFA. For example, the Psoas major muscle has 50.70% SFA and 31.09% MUFA, suggesting meat with a reasonable proportion of monounsaturated fats, which are considered healthier than saturated fats. The PUFA content in pork meat ranged between 14.92% and 18.20%, depending on the anatomical region.

The fatty acid composition in turkey meat varies significantly between rearing systems. For example, turkey meat raised in an extensive system has an SFA content of 30.78%, MUFA of 29.32%, and PUFA of 36.60%, making it a good nutritional option, especially for those seeking leaner meat. On the other hand, turkey meat from free-range farming has a composition of 26.54% PUFA and 34.62% MUFA, with a higher SFA percentage by 7.26% compared to turkey raised in the extensive system. Turkey meat from the extensive system is more optimal for human consumption, with a higher proportion of beneficial fatty acids for the human body, 65.92% (PUFA+MUFA), compared to turkey meat raised in the free-range system, which has a PUFA and MUFA composition of 61.16%.

Goose raised in a free-range system produced meat with 31.09% SFA and 46.26% MUFA, making it a good source of monounsaturated fatty acids but a poorer source of PUFA, with only 20.44% PUFA.

Lamb raised in an extensive system has meat with a fat profile similar to other types of meat, with an SFA content of 47.91% and MUFA of 41.99%. The PUFA content is higher by 4.93% compared to the PUFA content in beef raised in the extensive system, but lower than other types of meat. The highest PUFA content is found in lamb raised in the extensive system (10.23%), while the lowest is in lamb raised in the intensive system. The semi-intensive rearing system produced lamb meat with a PUFA concentration of 10.06%, similar to the extensive system.

In buffalo, the fats in the meat are varied, with 45.01% SFA, 35.15% MUFA, and 18.84% PUFA for meat obtained from the intensive system, with a particular diet based on corn silage, indicating nutritious meat but rich in saturated fats. Buffalo meat obtained from the intensive system, with a diet based on pasture hay, had a higher PUFA composition (20.28%) and lower SFA and MUFA compared to buffalo meat from the intensive system with corn silage. This highlights the fact that diet plays a very important role in the nutritional value of buffalo meat.

The proportion of fatty acids in meat is essential for cardiovascular health. Monounsaturated fats (MUFA) are considered beneficial, helping to reduce the risks of heart diseases. Additionally, polyunsaturated fatty acids (PUFA), such as omega-3 and omega-6, are essential for the functions of the human body.

The composition of fatty acids (n-6 and n-3) and the atherogenic indices represent parameters that reflect the nutritional quality and benefits of meat for human consumption. Relevant indices analyzed for different types of meat were the omega 6/omega 3 ratio, the PUFA/SFA ratio, the atherogenic index, the thrombogenic index, and the hypocholesterolemic/hypercholesterolemic ratio. These indices help determine the impact of meat consumption on cardiovascular and overall human health.

The high content of n-6 fatty acid in broiler chicken meat is found in meat from chickens raised in an intensive system, with 30.96% (Table 3), while n-3 is 3.99%, giving an n-6/n-3 ratio of 7.77. This ratio is the lowest compared to the ratios calculated for chicken meat raised in free-range and organic systems. A higher omega-6 to omega-3 ratio can contribute to chronic inflammation in the body, as omega-6 promotes the synthesis of pro-inflammatory compounds. Omega-3, on the other hand, is anti-inflammatory and protects against cardiovascular diseases, supports brain function, and has a beneficial effect on overall health.

For free-range broiler chicken, the highest n-6/n-3 ratio recorded was 11.5, caused by a diet richer in cereals, which are high in omega-6, while the organic broiler chicken had an n-6/n-3 ratio of 8.29, being an intermediate option. Broiler chickens with access to pasture (free-range or organic) that consume green feed and insects should have a higher omega-3 intake, which reduces the n-6/n-3 ratio in their meat, but in this study, meat from the intensive system had a lower n-6/n-3 ratio, being more beneficial for the human body.

Table 3. Lipid indices calculated for different types of meat

Meat Type	Rearing System	Anatomical Region	n-6 %	n-3 %	n-6 /n-3	Pufa/ sfa	IA	IT	h/H	S
Broiler chicken	Intensive	Breast	30,96	3.99	7,77	1,05	0,39	0,77	2,76	[7]
			22.00	2.35	9.44	0.77	0.38	0.77	2.66	[8]
	Free range	Breast	25.77	2.43	11.5	0.86	0.38	0.78	2.52	
	Organic	Breast	29.22	3.38	8.29	1.01	0.39	0.75	2.59	
Beef	Extensive	Muscle *Longissimus dorsi*	n.d.	n.d.	1,90	0,10	0,91	n.d.	n.d.	[18]
	Intensive	Muscle *Longissimus lomborum*	3.60	1.40	2.51	0.109	n.d.			[10]
	Semi-intensive		3.67	1.42	2.54	0.106				
Pork	Intensive	Leg	n.d.			0,355	0,654	1,575	2.401	[19]
		Muscle *Longissimus dorsi*				0,330	0,723	1,584	2.170	
		Muscle *Psoas major*				0,374	1,067	1,918	1.948	
Turkey	Extensive	Breast	35.14	3.46	10.16	0.95	0,361	0,702	3.00	[12]
	Free range	Breast	23.64	2.90	8.80	0.91	0.46	1.00		[13]
Goose	Free range	Breast	19.76	0.46		0.66	0.34	0.87	2.93	[14]
Lamb	Extensive (Grazing)	-	8.16	2.00	4.13	0.87	n.d.			[16]
	Semi-intensive		8.21	1.77	4.69	0.82				
	Intensive (boxes)		6.52	1.12	5.86	0.82				
Buffalo	Intensive+ Corn Silage	Muscle *Longissimus thoracis*	19.09	1.53	12.47	0.42	0.48	1.32	n.d.	[17]
	Intensive + Pasture Hay		17.47	2.53	6.90	0.47	0.42	1.20		
	Grazing		17.61	3.07	5.74	0.39	0.39	1.09		

* Atherogenic index (IA), Thrombogenicity index (IT), Hypocholesterolemic/Hypercholesterolemic ratio (h/H), S- Source

The n-6/n-3 ratio is 1.90 for extensively raised beef, while for the intensive and semi-intensive systems, it is 2.51 and 2.54, respectively, suggesting a better balance between fatty acids compared to chicken meat.

Pork meat has a relatively high PUFA/SFA ratio (0.330) for the longissimus dorsi muscle, compared to beef (0.10). Turkey meat from extensively raised animals has an n-6 content of 35.14% and n-3 content of 3.46%, with an n-6/n-3 ratio of 10.16, suggesting that while it is a good protein source, it contains a less favorable fatty acid ratio.

Meat from free-range geese has a low n-3 content (0.46%), leading to an n-6/n-3 ratio of 42.93, which can be considered very unfavorable for human health.

The fatty acid profile for lamb meat is more balanced, with an n-6/n-3 ratio of 4.13 for extensive (grazing) raising, 4.69 for semi-intensive, and 5.86 for intensive systems. The n-6 and n-3 composition is lower compared to other types of meat, with n-6 values ranging from 6.52% for the intensive system to 8.21% for the semi-intensive system, while n-3 values range from 1.12% (intensive) to 2.00% (extensive).

Buffalo raised in the intensive system has an n-6 content of 19.09% and n-3 content of 1.53%, with an n-6/n-3 ratio of 12.47, suggesting a predominance of n-6 fatty acids. The lowest n-6/n-3 ratio was 5.74% for buffalo meat raised through grazing.

The PUFA/SFA ratio is an important indicator for cardiovascular health. For broiler chicken raised in the intensive system, the ratio is 1.05, suggesting an acceptable balance, while for broiler chicken raised in the free-range system, the ratio is 0.86, which is less favorable. For beef, the values are much lower (0.109 and 0.106), suggesting a higher content of SFA compared to PUFA. Pork meat has a relatively low ratio, ranging from 0.330 to 0.374. Turkey meat has a very good PUFA/SFA ratio of 0.95 (extensive) and 0.91 (free-range).

A higher atherogenic index (AI) indicates a greater risk of cardiovascular diseases. The highest AI was observed in pork raised in the intensive system, specifically, the psoas major muscle had an AI of 1.067. The lowest value was observed in meat from geese raised in the free-range system (0.34), followed by the breast of broiler chicken raised in both the intensive and free-range systems (0.38). A higher AI (0.91) was also recorded for beef meat obtained in the extensive system.

IT is an indicator of the thrombogenic potential of fats, meaning it reflects the potential of fats to contribute to the formation of blood clots. A lower IT is associated with a reduced risk of thrombotic events. The Thrombogenicity index (TI) varies, with higher values greater than 1.00 for pork raised in the intensive system (1.575-1.918) and buffalo meat (1.09-1.32), indicating a potential higher toxicity of the fats consumed. The lowest values were observed in turkey meat raised extensively (0.702) and in organic broiler chicken meat (0.750), indicating a reduced risk of clot formation.

The h/H (hypo/hypercholesterolemic) ratio indicates the balance between "good" cholesterol (HDL) and "bad" cholesterol (LDL), with a higher ratio suggesting a lower risk of cardiovascular diseases, while a lower ratio indicates an increased risk due to the predominance of LDL cholesterol. A h/H ratio greater than 1 indicates a favorable balance for cardiovascular health, suggesting a lower risk of heart disease, while a ratio less than 1 signifies an increased risk due to the predominance of "bad" cholesterol (LDL).

The values for the h/H ratio for broiler chicken meat, such as 2.66-2.76 (intensive), 2.52 (free-range), and 2.59 (organic), suggest a moderate content of unsaturated fats compared to saturated fats [22]. These values indicate that, despite the nutritional benefits of chicken meat, such as high-quality proteins, there are concerns regarding the quality of fats.

High values indicate a significant content of unsaturated fats, which can be beneficial, as seen in pork meat, which has an h/H ratio of 2.401 for the ham, 2.170 for the longissimus dorsi muscle, and 1.948 for the psoas major muscle. A higher h/H ratio suggests a preference for essential fatty acids, making pork meat a choice with a potentially positive impact on cardiovascular health [23].

Turkey meat has an h/H value of 3.00, the highest among all the types of meat analyzed, indicating a superior content of unsaturated fatty acids. This makes turkey meat a nutritionally superior choice, rich in healthy fats that can contribute to a favorable lipid profile.

Goose meat has an h/H value of 2.93, close to that of turkey, suggesting that goose meat also has a beneficial content of unsaturated fats, which may be useful for healthy diets.

In general, a higher h/H ratio is associated with a more favorable lipid profile, while lower values may indicate a predominance of saturated fats. Consuming meat with a higher h/H ratio, such as turkey or goose meat, may contribute to a more balanced and healthy diet, while broiler chicken meat, with a lower ratio, may require more attention when consumed frequently [24].

These observations align with the results of recent studies that highlight the importance of the quality of fats in the diet, considering their impact on overall health.

DISCUSSIONS

The farming systems significantly influence the nutritional value and quality of meat, including fatty acid content, amino acid profiles, and chemical composition [25].

The farming system plays a crucial role in determining the lipid composition of meat. It has been shown that the farming system significantly affects the chemical composition and physico-chemical properties of beef, and even rabbit meat [10,26]. In another study, it was highlighted that pigs raised in extensive systems have a higher content of unsaturated fatty acids compared to those raised in conventional systems [27]. These differences are explained by variations in the feed provided and the physical activity of the animals [28].

According to a study, cattle raised on pasture have a healthier lipid profile, with a better ratio of omega-6 to omega-3 fatty acids compared to animals fed concentrates [18]. These differences in lipid profiles are also associated with a reduced health risk for consumers, potentially offering a protective role in preventing cardiovascular diseases [29].

In addition to the lipid profile, the protein composition of the meat is influenced by the type of farming system [30]. It has been shown that Turkish goose varieties raised in extensive systems have a different content of essential amino acids compared to those raised intensively, which can improve the nutritional value of the meat for consumers [14]. Similarly, Chaohu ducks raised in alternative systems were reported to have a different chemical composition and amino acid profile compared to those raised in conventional systems [31].

Differences in proteins and amino acids can be explained by variations in muscle activity and the available feed, especially in extensive systems, where animals have access to diverse natural resources. These practices lead to increased muscle activity, which can affect protein density and its biological value [32].

It is also important to note that the species and sex of the animals also influence the nutritional value of the meat [33]. For example, differences in the nutritional value of turkey muscles were studied according to sex, showing that male turkeys have a slightly different composition of proteins and fatty acids compared to females [12], highlighting the need to consider both species and sex when evaluating meat quality [34].

Sensory quality of meat is another aspect influenced by the farming system [35]. In Taiwan, free-range farming systems had a positive impact on the sensory properties of chicken meat, including texture and taste. These results are also supported by studies on ducks [36], which reported that ducks raised in extensive systems had meat with a softer and juicier texture than those raised in conventional systems.

Broiler chicken meat is one of the leanest protein sources, with a low saturated fat content, making it popular in healthy diets. It contains B vitamins (especially B3 and B6) and minerals such as phosphorus and selenium [37].

Broiler chickens raised intensively are fed rations formulated to maximize rapid growth, resulting in meat with a high protein content and lower fat, especially saturated fat [38]. Chickens raised in extensive systems have access to pasture and a diverse diet, which leads to meat with a more favorable lipid profile, being richer in omega-3 fatty acids and natural antioxidants [2].

The differences between organic and conventional production systems are highlighted, with organic-raised chickens showing superior quality in terms of texture and nutrient content. The study suggests that the organic system may improve the meat's microbiological and sensory quality [39]. In a similar study, it was observed that chickens raised conventionally tend to have a higher fat and cholesterol content, while those in organic systems are perceived to have healthier meat, due to the lower fat content and the presence of more favorable fatty acid profiles [40].

Organic systems are observed to improve the fatty acid profile of meat, adding nutritional value compared to conventional methods [41]. This suggests that organically raised chickens are healthier for consumption due to a higher proportion of polyunsaturated fatty acids.

There is a significant impact of different production systems on the quality and shelf life of chicken meat. Conventional methods lead to faster degradation of the meat, caused by oxidation processes [42]. Organic-raised chickens have a higher antioxidant content in their meat, contributing to improved quality and shelf life. On the other hand, conventionally raised chickens have faster growth but their meat is more prone to issues like "white striping" [43].

Ducks raised intensively produce meat with a higher fat content but also essential fatty acids, which can be beneficial to health in moderation [44]. Ducks raised extensively have lower fat content and healthier meat with a more favorable lipid profile [45].

Other studies explore how different farming systems affect the fatty acid and cholesterol content of chicken meat [46]. It is concluded that ecological farming methods lead to meat with a more balanced fatty acid profile and a lower cholesterol content. Similarly, a detailed analysis of the fatty acid profile in chickens raised in industrial systems highlights that these tend to have a higher content of saturated fatty acids, which may be less favorable for health [7].

A new bio-packaging system has been evaluated that extends the shelf life of organic chicken meat, demonstrating that innovative packaging technologies can protect the nutritional and microbiological quality of meat in the long term [47].

Furthermore, how poultry handling methods and processing techniques affect the final quality of meat has been investigated. The importance of strict quality control processes to ensure safe and high-quality meat is highlighted [48].

The use of different types of pasture can affect the carcass weight and meat quality of chickens raised in free-range systems [49]. Birds raised with access to pasture had better meat quality, with lower fat content and firmer texture. Slow-growing chickens have leaner meat and a higher protein proportion, making them more attractive to health-conscious consumers [50].

Chicken meat raised in industrial or ecological systems has a protein content of approximately 23-24%, comparable to that of beef and pork, but superior to that of duck or goose meat [8].

The fats in broiler chicken meat differ significantly from those in other types of meat, both in terms of quantity and the quality of fatty acids. Broiler chicken meat is considered lean, with a total fat content of around 2-6%, depending on the cut and the farming system (industrial, free-range, organic) [9]. This percentage is much lower compared to pork or beef meat, which can contain between 10-20% fat.

Broiler chicken meat is an important source of B vitamins, especially B3 (niacin) and B6, which are essential for energy metabolism. It also contains moderate amounts of zinc and iron, but its iron content is lower compared to red meats such as beef or lamb [28]. Beef meat is considered superior in terms of heme iron content, essential for preventing anemia.

However, chicken meat has a higher selenium content, an important antioxidant that contributes to cellular protection against oxidative stress, compared to pork and beef meat [51]. For example, research on buffalo meat [52] and goose meat has shown a relatively lower selenium content in these types of meat [14].

Broiler chickens raised in free-range systems and those with access to pastures have higher levels of omega-3 and omega-6 fatty acids compared to broilers in industrial systems, due to their diet being richer in greens [38]. Similarly, beef from cattle fed exclusively with grass has a healthier fatty acid profile than that from cattle fed concentrated feed [53].

Pork raised in free-range systems also has a higher PUFA content [30] and a more favorable omega-6/omega-3 ratio compared to pigs raised in intensive systems [11].

The texture and taste of broiler chicken meat differ from other types of meat. Broiler chicken meat has a softer texture and a greater ability to retain water compared to beef or pork [37]. This makes chicken preferable in diets that require better digestibility and lower caloric intake. In contrast, beef or lamb meat has a denser texture with coarser muscle fibers, contributing to a different sensation in the mouth. Also, duck and goose meat has a more intense flavor and firmer texture, making them less popular for daily consumption but preferred in specific cuisines.

Intensively raised buffalo tend to have meat with a higher content of saturated fats, similar to beef [54]. Buffalo raised extensively have a more favorable lipid profile, with lower saturated fat content and better nutritional quality [52].

Based on these comparisons, broiler chicken meat stands out for its high protein content, healthy fatty acid profile, and adequate levels of essential micronutrients. While beef and pork provide higher amounts of iron and B vitamins, chicken meat is generally preferred for low-fat diets and its cardiovascular benefits, especially when raised in more sustainable farming systems like free-range or organic.

CONCLUSIONS

We observe that, typically, meat from animals raised free-range has a more favorable fatty acid profile (higher in MUFA and PUFA) compared to meat from intensive farming, which is an important factor to consider when choosing meat.

Extensive farming systems provide meat with a fat profile that can be more balanced and healthier due to the natural diet of the animals.

The type of meat and the farming system significantly influence the fatty acid composition.

Meat from animals raised in free-range or organic systems appears to have a more favorable nutritional profile, with a better ratio of essential fatty acids n-6 to n-3. Consuming meat from sources with a lower n-6/n-3 ratio may be beneficial for cardiovascular health and may help maintain a healthy nutritional balance. It is essential to take this information into account when selecting meat sources for the daily diet.

The results of this study suggest that the farming system has a major impact on the nutritional value and overall quality of the meat. Furthermore, these farming systems can positively influence the sensory properties of the meat.

For consumers, choosing meat from extensive farming systems can provide important nutritional benefits, while for producers, these systems could become an effective marketing strategy, given the current trend among consumers to seek natural and healthy foods.

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