University "St. Kliment Ohridski" - Bitola, Republic of North Macedonia
Faculty of Technology and Technical Sciences - Veles

Book of proceedings of the 1st International Scientific Conference - Food Science, Nutrition, Innovative Technologies and Sustainability

Veles, North Macedonia
February 2026

University "St. Kliment Ohridski" - Bitola, Republic of North Macedonia

Faculty of Technology and Technical Sciences - Veles

Book of proceedings of the 1st International Scientific Conference - Food Science, Nutrition, Innovative Technologies and Sustainability

Veles, North Macedonia
February 2026

Publication Title: Book of Proceedings of the 1st International Scientific Conference - Food Science, Nutrition, Innovative Technologies and Sustainability

Publisher: University "St. Kliment Ohridski" - Bitola, Faculty of Technology and Technical Sciences - Veles

Editor-in-chief: Assoc. Prof. Dr. Sc Vezirka Jankuloska, Faculty of Technology and Technical Sciences - Veles, University “St. Kliment Ohridski” – Bitola, Republic of North Macedonia

Editor: Prof. Dr. Sc Vesna Knights, Faculty of Technology and Technical Sciences- Veles, University “St. Kliment Ohridski” – Bitola, Republic of North Macedonia

Technical Editor and Graphic Design: Tanja Stojanovska, Jordan Martinovski, Faculty of Technology and Technical Sciences - Veles, University "St. Kliment Ohridski" - Bitola, Republic of North Macedonia

All papers included in this volume were peer-reviewed by members of the Scientific Committee and Reviewers from a relevant scientific field.

Edition: e-edition

Year of publication: 2026

CIP - Каталогизација во публикација
Национална и универзитетска библиотека "Св. Климент Охридски", Скопје

613.2(062)
616-083.2(062)
606:663/664(062)

INTERNATIONAL Scientific Conference - Food Science, Nutrition, Innovative Technologies and Sustainability (1 ; 2025 ; [Veles])
Book of proceedings of the 1st International Scientific Conference - Food Science, Nutrition, Innovative Technologies and Sustainability [Електронски извор] / [editor-in-chief Vezirka Jankuloska]. - Veles : University "St. Kliment Ohridski" - Bitola, Faculty of Technology and Technical Sciences, 2026

Начин на пристапување (URL): https://ttfv.uklo.edu.mk/2026/02/20/book-of-proceedings-of-the-1st-international-scientific-conference-food-science-nutrition-innovative-technologies-and-sustainability/.
- Текст во ПДФ формат, содржи 193 стр., илустр. - Наслов преземен од екранот. - Опис на изворот на ден 09.03.2026. - Фусноти кон текстот. - Библиографија кон трудовите

ISBN 978-608-67527-0-5

а) Храна -- Квалитет -- Собири б) Исхрана -- Здравствени аспекти -- Собири в) Храна -- Биотехнологија -- Собири

COBISS.MK-ID 68355333

Message from the Dean and Editor-in-Chief

It is with immense pleasure and pride that I present the *Book of Proceedings* of the **1st International Scientific Conference – Food Science, Nutrition, Innovative Technologies and Sustainability**. This landmark event marks an important milestone in our continued commitment to advancing research, innovation, and global collaboration in the vital fields of food science and sustainable development.

The conference has brought together distinguished researchers, academicians, industry experts, policymakers, and students from across the globe to exchange knowledge, share cutting-edge research findings, and explore transformative solutions. The theme, *Food Science, Nutrition, Innovative Technologies and Sustainability*, reflects the urgent global need to address food security, public health, environmental sustainability, and technological advancement through interdisciplinary and evidence-based approaches.

The papers compiled in this volume represent rigorous scientific inquiry and innovative thinking. They highlight emerging trends in functional foods, clinical and public health nutrition, food safety and quality assurance, sustainable food systems, biotechnology, digital transformation in food processing, and environmentally responsible technologies. Collectively, these contributions underscore the critical role of science and innovation in building resilient and sustainable food systems for future generations.

As Dean, I extend my heartfelt appreciation to all participants whose dedication and scholarly excellence have made this conference a success. As Editor-in-Chief, I sincerely thank the authors for their valuable contributions and the reviewers for their careful evaluation and constructive feedback, which have ensured the high academic standards of this publication. I also acknowledge the tireless efforts of the organizing and editorial committees in bringing this volume to fruition.

It is our hope that this *Book of Proceedings* will serve not only as a record of the conference but also as a lasting resource that inspires continued research, collaboration, and innovation in food science, nutrition, and sustainable technologies.

I congratulate all contributors and express my deepest gratitude to everyone who has supported this important academic endeavor.

Assoc. Prof. Dr. Sc Vezirka Jankuloska
Dean & Editor-in-Chief
Faculty of Technology and Technical Sciences - Veles, University "St. Kliment Ohridski" – Bitola, Republic of North Macedonia
Fevruary, 2026

Message from the Editor

As Editor of this proceedings volume, it is my honor to present is my great honor to welcome you to **the Proceedings of the 1st International Scientific Conference on Food Science, Nutrition, Innovative Technologies and Sustainability**, held on 03 October 2025.

This volume presents a collection of original scientific contributions covering a broad spectrum of topics, including food science, nutrition and public health nutrition, dietary strategies in health and disease, modeling and optimization in nutrition, functional foods, food quality and safety, contaminants in food and environmental aspects, sustainable food systems and food security, food chemistry and microbiology, innovative food technologies, and consumer behavior in food.

The peer-review process ensured the scientific quality and relevance of the published contributions. The selected papers demonstrate scientific rigor, methodological soundness, and relevance to current challenges in food quality, safety, public health, and sustainable development.

The aim of this conference—and of this proceedings volume—is to provide a platform for scientific exchange, strengthen regional and international collaboration, and encourage the development of innovative, evidence-based solutions in the field of food and nutrition sciences.

I would like to express my sincere appreciation to all authors for their valuable contributions, to the reviewers for their careful and constructive evaluations, and to the members of the Organizing and Editorial Committees for their dedication and professionalism.

It is my hope that this volume will serve as a valuable scientific reference and inspire future research collaborations and initiatives.

Prof. Dr. Sc. Vesna Knights
Editor
Vice Dean for Science and International Cooperation
University “St. Kliment Ohridski” – Bitola
Faculty of Technology and Technical Sciences – Veles
Republic of North Macedonia

About us

The Faculty of Technology and Technical Sciences (www.ttfv.uklo.edu.mk) (Dimitar Vlahov no. 57, 1400 Veles, North Macedonia https://maps.app.goo.gl/2HKzpi1VmZAypuwj9) - Veles is part of the University "St. Kliment Ohridski" – Bitola (UKLO). It was established in 2008 as a national academic institution offering undergraduate study programs in:

-Food Technology and Biotechnology and

-Nutrition Science.

In 2012, the Faculty introduced second-cycle graduate studies in:

-Food Quality and Safety and

-Nutrition Science.

After followed by a doctoral study program in:

-Innovative Technologies in Food and Nutrition, with a duration of three years.

TTFV is supported by a multidisciplinary academic staff with expertise in food science, nutrition, biotechnology, biochemistry, medicine, public health, epidemiology, food toxicology, and food safety. The Faculty actively participates in national and international scientific projects and continuously follows novel trends in food science, food technology, biotechnology, and nutrition.

Mission

The mission of the Faculty of Technology and Technical Sciences – Veles is to provide continuous education of highly qualified professionals through high-quality programs in food technology, biotechnology, and nutrition. Scientific research activities are strengthened through doctoral studies and participation in international research projects, while strong support is provided for technological development and knowledge transfer to the food industry. The Faculty holds a leading national position in nutrition and is continuously strengthening its international reputation.

Vision

The Faculty aims to maintain its leading position in education in nutrition and to be among the leaders in food technology and biotechnology, to strengthen cooperation with industry, and to expand collaboration with renowned foreign universities through joint educational and scientific research activities.

European University Alliance
COLOURS
COLlaborative innOvative sUstainable Regional univerSities

Прехранбено-технолошки центар
за развој на иновативни продукти

CERTIFICATE

is awarded to

for PARTICIPATION to the
1ST INTERNATIONAL SCIENTIFIC CONFERENCE
FOOD SCIENCE, NUTRITION, INNOVATIVE TECHNOLOGIES AND SUSTAINABILITY

03 October 2025
Veles, Republic of North Macedonia

Vezirka Jankuloska, Assoc. Prof. Dr. Sc
Dean of the Faculty of Technology and
Technical Sciences - Veles

ORGANIZING COMMITTEE

Vezirka Jankuloska, PhD, Dean, University "St. Kliment Ohridski" – Bitola, Faculty of Technology and Technical Sciences – Veles, Republic of North Macedonia

Vesna Knights, PhD, Vice-Dean for Science and International Cooperation, University "St. Kliment Ohridski" – Bitola, Faculty of Technology and Technical Sciences - Veles, Republic of North Macedonia

Aleksandar Stanković, PhD, Vice-Dean for Science and International Cooperation, Faculty of Applied Sciences – Niš, University of Economics Academy in Novi Sad, Serbia

INTERNATIONAL SCIENTIFIC COMMITTEE

Vesna Knights, PhD, University "St. Kliment Ohridski" - Bitola, Faculty of Technology and Technical Sciences – Veles, Republic of North Macedonia

Anka Trajkoska Petkoska, PhD, University "St. Kliment Ohridski" - Bitola, Faculty of Technology and Technical Sciences – Veles, Republic of North Macedonia

Vezirka Jankuloska, PhD, University "St. Kliment Ohridski" - Bitola, Faculty of Technology and Technical Sciences – Veles, Republic of North Macedonia

Gorica Pavlovska, PhD, University "St. Kliment Ohridski" - Bitola, Faculty of Technology and Technical Sciences – Veles, Republic of North Macedonia

Valentina Velkovski, PhD, University "St. Kliment Ohridski" - Bitola, Faculty of Technology and Technical Sciences – Veles, Republic of North Macedonia

Tatjana Kalevska, PhD, University "St. Kliment Ohridski" - Bitola, Faculty of Technology and Technical Sciences – Veles, Republic of North Macedonia

Daniela Nikolovska Nedelkoska, PhD, University "St. Kliment Ohridski" - Bitola, Faculty of Technology and Technical Sciences – Veles, Republic of North Macedonia

Viktorija Stamatovska, PhD, University "St. Kliment Ohridski" - Bitola, Faculty of Technology and Technical Sciences – Veles, Republic of North Macedonia

Tatjana Blazhevska, PhD, University "St. Kliment Ohridski" - Bitola, Faculty of Technology and Technical Sciences – Veles, Republic of North Macedonia

Nevena Gruevska, PhD, University "St. Kliment Ohridski" - Bitola, Faculty of Technology and Technical Sciences – Veles, Republic of North Macedonia

Sanja Sazdovska, PhD, University "St. Kliment Ohridski" - Bitola, Faculty of Technology and Technical Sciences – Veles, Republic of North Macedonia

Namik Durmishi, PhD, University of Tetova, Faculty of Food Technology and Nutrition, Tetovo, Republic of North Macedonia

Gafur Xhabiri, PhD, University of Tetova, Faculty of Food Technology and Nutrition, Tetovo, Republic of North Macedonia

Ismail Ferati, PhD, University of Tetova, Faculty of Food Technology and Nutrition, Tetovo, Republic of North Macedonia

Vladimir Kitanovski, PhD, Mother Teresa University, Skopje, Republic of North Macedonia

Aksu Samet, PhD, International Balkan University, Faculty of Dental Medicine, Skopje, Republic of North Macedonia

Ljupcho Mihajlov, PhD, "Goce Delchev" University, Faculty of Agriculture, Shtip, Republic of North Macedonia

Emilija Arsov, PhD, "Goce Delchev" University, Faculty of Agriculture, Shtip, Republic of North Macedonia

Frosina Babanovska-Milenkovska, PhD, "Ss. Cyril and Methodius" University – Skopje, Faculty of Agricultural Sciences and Food, Republic of North Macedonia

Mishela Temkov, PhD, "Ss. Cyril and Methodius" University – Skopje, Faculty of Technology and Metallurgy, Republic of North Macedonia

Dimitar Nakov, PhD, "Goce Delchev" University, Faculty of Agriculture, Shtip, Republic of North Macedonia

Ljubica Karakashova, PhD, "Ss. Cyril and Methodius" University – Skopje, Faculty of Agricultural Sciences and Food, Republic of North Macedonia

Jasenka Gajdoš Kljusurić, PhD, University of Zagreb, Faculty of Food Technology and Biotechnology, Zagreb, Croatia

Tamara Jurina, PhD, University of Zagreb, Faculty of Food Technology and Biotechnology, Zagreb, Croatia

Jasmina Lukinac, PhD, Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology, Osijek, Croatia

Marko Jukić, PhD, Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology, Osijek, Croatia

Aleksandar Stanković, PhD, University of Economics Academy in Novi Sad, Faculty of Applied Sciences – Niš, Serbia

Filip Cvetković, PhD, University of Economics Academy in Novi Sad, Faculty of Applied Sciences – Niš, Serbia

Jasminka Gligorijević, PhD, Faculty of Applied Sciences – Niš, University of Business Academy in Novi Sad, Serbia

Sanja M. Petrović, PhD, University of Niš, Faculty of Technology – Leskovac, Serbia

Saša Savić, PhD, University of Niš, Faculty of Technology – Leskovac, Serbia

Arber Hyseni, PhD, University "Isa Boletini" – Mitrovica, Faculty of Food Technology, Kosovo

Indrit Loshi, PhD, University "Haxhi Zeka" – Peja, Faculty of Agribusiness, Kosovo

Joanna Harasym, PhD, University of Economics – Wrocław, Faculty of Production Engineering, Department of Biotechnology and Food Analysis, Poland

Agnieszka Orkusz, PhD, University of Economics – Wrocław, Faculty of Production Engineering, Department of Biotechnology and Food Analysis, Poland

Amrita Poonia, PhD, Banaras Hindu University, Institute of Agricultural Sciences – Department of Dairy Science and Food Technology, Varanasi, India

Nishant Kumar, PhD, National Institute of Food Technology Entrepreneurship and Management, New Delhi, India

Velitchka Gocheva, PhD, University of Food Technology-Plovdiv, Department of Biotechnology, Bulgaria

Mersiha Suljkanović, PhD, University of Tuzla, Faculty of Natural Sciences and Mathematics, Bosnia and Herzegovina

Zoltán Kovács, PhD, Hungarian University of Agriculture and Life Sciences, Institute of Food Science and Technology, Hungary

Gokhan Durmaz, PhD, Inonu University, Department of Food Engineering, Malatya, Turkey

Deniz İnnal, PhD, Burdur Mehmet Akif Ersoy University, Faculty of Arts and Sciences, Department of Biology, Burdur, Turkey

Didem Cinkilic, PhD, Aydin Adnan Menderes University, Department of Food Engineering, Turkey

Rigerta Sadikaj, PhD, University of Tirana, Faculty of Natural Sciences, Department of Biotechnology, Albania

Dritan Arapi, University of Tirana, Faculty of Natural Sciences, Department of Biotechnology, Albania

UDK: 637.5'64.043(497.7)"2020/2024"
637.5'652/'658.043(497.7)"2020/2024"

COMPARATIVE EVALUATION OF FATTY ACID PROFILES IN COMMON MEAT CUTS

Nadica Bajraktarova[1[0009-0003-7124-5021]], Dimitar Nakov[1[0000-0001-6159-5595]], Aco Kuzelov[1[0000-0003-2472-4401]]

[1] Department of Food Technology and Processing of Animal Products, Faculty of Agriculture, Goce Delcev University, Stip, North Macedonia
E-mail: nadica.209139@student.ugd.edu.mk

Abstract
Meat production and consumption in North Macedonia have undergone notable shifts influenced by economic development and changing dietary habits. Meat serves as a vital source of essential nutrients, particularly high-quality protein and biologically active fatty acids that play a significant role in cardiovascular health. This study aimed to assess the nutritional quality of pork and poultry meat by conducting a comparative analysis of their fatty acid profiles, using standard chemical composition methods. An analysis of pork and poultry meat production and consumption was conducted to reflect the dietary habits of Macedonian citizens. Between 2020 and 2024, total pork production reached 67,961 tons, while poultry production amounted to 9,202 tons during the same period. In 2024, average household consumption was estimated at 23.7 kg of pork and 46.5 kg of poultry meat. The analysis revealed that chicken breast contains a low-fat content of 2.4 g per 100 g and features a favorable ratio of polyunsaturated to saturated fatty acids, primarily attributed to higher levels of linoleic and linolenic acids. Conversely, pork cuts such as neck and belly exhibited considerably higher fat content, ranging from 13.02 to 18.75 g per 100 g, along with elevated concentrations of saturated fatty acids, particularly palmitic and stearic acids.These findings underscore the nutritional advantage of poultry as a leaner meat option with a healthier fat composition. Considering these differences, it is recommended to prioritize poultry consumption to promote improved lipid balance and to mitigate long-term health risks associated with excessive intake of saturated fats.

Keywords: Meat Consumption, Nutritional Quality, Fatty Acids

1. Introduction

Meat remains a central component of the human diet, providing high-quality protein, essential amino acids, vitamins, and minerals (McCance & Widdowson, 2014; Pereira & Vicente, 2013). It is also an important source of bioactive compounds, such as carnosine and taurine, which play roles in physiological functions including muscle performance, antioxidant defense, and metabolic regulation (Vongsawasdi & Noomhorm, 2014).

In North Macedonia, consumption patterns have shifted in recent years due to socioeconomic changes, global dietary trends, and increasing health awareness (National Statistical Office of North Macedonia, 2024). Among all meat types, pork and poultry represent the most widely consumed in the country, yet they differ significantly in terms of fat content, fatty acid composition, and overall nutritional quality (Covaciu et al., 2024; Scollan et al., 2017; Wood et al., 2004).

Fat content and fatty acid composition are critical parameters for evaluating the health impact of meat consumption. Saturated fatty acids (SFA), abundant in certain pork cuts, have been

linked to elevated low-density lipoprotein (LDL) cholesterol levels, contributing to increased risk of cardiovascular diseases (Wood et al., 2004). In contrast, polyunsaturated fatty acids (PUFA), especially omega-3 and omega-6 fatty acids, are known to improve lipid metabolism, reduce inflammation, and promote heart health (Estany Illa et al., 2017; Scollan et al., 2017). The ratio of PUFA to SFA in meat is therefore considered an important nutritional indicator, reflecting the balance between potentially harmful and beneficial fatty acids (Wood et al., 2004).

Poultry meat, particularly chicken breast, is often characterized by lower total fat content and higher PUFA levels compared to pork, making it a leaner and healthier protein source (Abdullah et al., 2025; Wideman et al., 2016). On the other hand, pork cuts such as neck and belly contain higher SFA and total fat, which may limit their consumption among health-conscious individuals (Covaciu et al., 2024). Despite these differences, pork remains a staple in many households due to its taste, availability, and traditional culinary uses. Understanding these nutritional differences is critical for developing dietary recommendations and guiding consumer choices (Pereira & Vicente, 2013; Scollan et al., 2017).

In addition to fat content, other meat quality parameters such as pH, water-holding capacity (WHC), and color significantly influence sensory attributes, processing characteristics, and shelf life (Tapp III et al., 2011; Wideman et al., 2016). The pH affects meat tenderness and microbial stability, while WHC is important for juiciness and cooking yield. Color, expressed in L*, a*, and b* values, is a key factor affecting consumer acceptance, as it signals freshness and quality. Assessing these physicochemical traits alongside nutritional composition provides a comprehensive understanding of meat quality (Wood et al., 2004; Wideman et al., 2016).

Monitoring production and consumption trends is also essential to contextualize nutritional evaluations. Between 2020 and 2024, meat production in North Macedonia has been influenced by economic factors, supply chain dynamics, and evolving consumer preferences (National Statistical Office of North Macedonia, 2024). Poultry has increasingly become the preferred choice, possibly due to its favorable fat profile, affordability, and adaptability in various culinary practices (Abdullah et al., 2025). By combining chemical analyses with production and consumption data, this study provides a holistic evaluation of pork and poultry meat in the Macedonian context.

The aim of this study was to compare the proximate composition, physicochemical parameters, and fatty acid profiles of pork and poultry meat, with an emphasis on understanding their nutritional differences. Additionally, the study sought to analyze production and consumption trends to assess how dietary habits may align with recommendations for healthier meat consumption. This information is intended to guide both consumers and policymakers in promoting balanced and health-conscious dietary practices.

2. Methods and materials

Representative samples of pork (neck and belly cuts) and poultry (chicken breast) were collected from retail markets across North Macedonia. These cuts were selected as they represent commonly consumed portions with distinct differences in fat content and overall nutritional composition (Covaciu et al., 2024; Pereira & Vicente, 2013). All samples were handled under controlled hygienic conditions, vacuum-packed, and transported at refrigerated temperatures (0–4°C) to the laboratory for analysis to preserve freshness and prevent alterations prior to testing (AOAC, 2019).

The proximate composition of the meat, including protein, fat, moisture, and ash content, was determined according to standardized methods approved by the Association of Official Analytical Chemists and ISO standards (ISO 1442:1997 for moisture; ISO 937:2023 for protein; EN ISO 936:1998 for ash) (AOAC, 2019; ISO 1442, 1997; ISO 937, 2023; EN ISO 936, 1998). The pH value of each sample was measured using a calibrated penetration electrode (ISO 2917:1999), as this parameter directly affects meat quality and microbial stability (ISO 2917, 1999). Water-holding capacity (WHC) was assessed by a gravimetric method, providing insights into the ability of the meat to retain water during processing and cooking, which influences

juiciness and texture (Tapp III et al., 2011).

Color parameters were determined using a Minolta colorimeter, with results expressed in the CIE Lab* system: L* for lightness, a* for redness, and b* for yellowness (Wideman et al., 2016). This provided an objective evaluation of meat appearance, an important quality trait influencing consumer perception.

For fatty acid analysis, lipids were first extracted from the samples and then methylated to obtain fatty acid methyl esters (FAME). The fatty acid profile was determined using gas chromatography with flame ionization detection (GC-FID), in accordance with international standards (ISO 5508:1990; ISO 5509:2000; Waktola et al., 2020), allowing precise identification and quantification of saturated, monounsaturated, and polyunsaturated fatty acids.

Additionally, production and consumption data for pork and poultry in North Macedonia for the period 2020–2024 were obtained from the National Statistical Office (2024). These data provided contextual information on dietary trends and allowed a link between the nutritional quality of meat and actual consumption patterns in the population.

3. Results and discussion

This study examines the proximate composition of chicken breast and two pork cuts, neck and belly, to assess their nutritional quality. Chicken breast was found to have high protein content and low-fat levels, making it a lean meat source. In contrast, pork cuts, particularly belly, showed higher fat content and lower protein, reflecting their traditional culinary usage and contribution to dietary fat intake. Moisture levels were inversely related to fat content, with leaner cuts retaining more water, which affects juiciness and tenderness.

Table 1: Proximate composition of pork and poultry meat samples (g/100 g fresh weight)

Sample	Protein	Fat	Moisture	Ash
Chicken breast	22.5	2.40	74.5	1.1
Pork neck	18.7	13.02	66.2	1.0
Pork belly	16.8	18.75	63.0	1.0

The ash content measured across all samples was relatively low, consistent with typical meat composition. Chicken breast, with 22.5 g of protein per 100 g, provides a high-quality source of protein suitable for health-conscious diets. Its low fat content (2.4 g/100 g) contrasts sharply with pork neck and belly, which contained 13.02 g and 18.75 g of fat per 100 g, respectively. Moisture content was highest in chicken breast at 74.5%, decreasing with increasing fat in pork cuts. These findings emphasize the nutritional advantages of poultry as a lean meat option, while highlighting the variability in fat and protein content among pork cuts, which may influence both culinary properties and dietary health considerations.

The physical characteristics of chicken breast and pork cuts, including pH, color, and water-holding capacity (WHC), were evaluated to determine their technological and sensory quality. Chicken breast showed a slightly higher pH of 5.8 compared to pork neck (5.6) and pork belly (5.7), indicating near-neutral acidity and favorable conditions for maintaining meat tenderness. Color measurements revealed that chicken breast had higher lightness (L* = 56.2) and lower redness (a* = 1.9) than the pork cuts, reflecting its pale appearance typical of poultry. Water-holding capacity was also higher in chicken breast at 66.4%, suggesting better juiciness and suitability for various cooking methods.

Table 2: pH, color parameters and water-holding capacity (WHC)

Sample	pH	L*	a*	b*	WHC (%)
Chicken breast	5.8	56.2	1.9	11.2	66.4
Pork neck	5.6	42.5	10.2	14.8	58.3
Pork belly	5.7	44.1	9.8	15.3	57.5

The recorded values indicate that chicken breast has superior lightness and water-holding capacity compared to pork cuts, contributing to better visual appeal and juiciness. The higher redness and yellowness in pork neck and belly reflect the darker colour and fat content typical of these cuts. Lower WHC values in pork cuts may be associated with higher fat content and reduced moisture retention, which can influence texture and cooking performance. Overall, these results highlight differences in both sensory and technological properties between poultry and pork, supporting the preference for chicken as a lean, tender meat option.

The fatty acid profiles of chicken breast and pork cuts were analyzed to evaluate their nutritional quality and implications for health. Chicken breast demonstrated a lower overall saturated fatty acid (SFA) content, with palmitic acid (C16:0) at 20.3% and stearic acid (C18:0) at 8.5%, while pork neck and belly contained higher SFA levels, reaching 25.4–27.1% for palmitic acid and 12.1–13.3% for stearic acid. Chicken breast was also richer in polyunsaturated fatty acids (PUFAs), including linoleic (C18:2, 25.6%) and linolenic (C18:3, 4.2%) acids, which contribute to a healthier lipid profile. Oleic acid (C18:1), a monounsaturated fatty acid, was the predominant fatty acid in all samples, with slightly higher concentrations in pork cuts (37.8-38.2%) compared to chicken breast (32.4%).

Table 3: Fatty acid composition (%) of pork and poultry meat

Fatty Acid	Chicken breast	Pork neck	Pork belly
Palmitic (C16:0)	20.3	25.4	27.1
Stearic (C18:0)	8.5	12.1	13.3
Oleic (C18:1)	32.4	38.2	37.8
Linoleic (C18:2)	25.6	14.2	13.0
Linolenic (C18:3)	4.2	2.1	1.8

The results indicate that chicken breast offers a more favourable PUFA/SFA ratio compared to pork cuts, which is important for cardiovascular health. The higher saturated fatty acid content in pork neck and belly may increase health risks if consumed in excess, while the elevated PUFA content in chicken contributes to improved lipid balance. These findings reinforce the nutritional advantage of poultry as a leaner meat option and provide a clear basis for dietary recommendations focused on healthier fat intake.

Production and consumption trends of pork and poultry in North Macedonia between 2020 and 2024 were analyzed to provide context for dietary patterns. Total pork production over the five-year period reached 67,961 tons, with an annual output of 11,880 tons in 2024 (National Statistical Office of North Macedonia, 2024). Poultry production was considerably lower, totaling 9,202 tons from 2020 to 2024, and 1,997 tons in 2024. Despite the lower production volume, poultry consumption per household averaged 46.5 kg in 2023, almost double the average pork consumption of 23.7 kg (National Statistical Office of North Macedonia, 2024). This indicates a clear preference for poultry among Macedonian households, likely reflecting its nutritional advantages as a leaner meat source with a healthier fatty acid profile.

Table 4: Pork and poultry production and consumption in North Macedonia (2020–2024)

Parameter	Value
Pork production (2024)	11,880 t
Pork production (2020–2024)	67,961 t
Poultry production (2024)	1,997 t
Poultry production (2020–2024)	9,202 t
Avg. pork consumption/household (2023)	23.7 kg
Avg. poultry consumption/household (2023)	46.5 kg

The data demonstrate that, although pork remains an important part of the diet, poultry is increasingly favored, likely due to its lower fat content, higher protein levels, and more favourable fatty acid composition. These trends provide insight into consumer behaviour and can inform recommendations for healthier meat consumption in North Macedonia.

4. Conclusion

Production and consumption trends in North Macedonia between 2020 and 2024 indicate that poultry is the preferred meat in households, reflecting growing consumer awareness of the health benefits associated with leaner meats. The comparative evaluation of pork and poultry meat highlights significant nutritional and compositional differences. Chicken breast is characterized by low fat content, high protein concentration, and a favourable fatty acid profile, including higher levels of polyunsaturated fatty acids (PUFAs) and an optimal PUFA/SFA ratio.

These attributes contribute to cardiovascular health, improved lipid balance, and make poultry a leaner, healthier meat option. In contrast, pork cuts such as neck and belly contain substantially higher total fat and saturated fatty acid (SFA) levels, particularly palmitic and stearic acids, which may pose increased health risks if consumed in excess. Physicochemical parameters, including pH, water-holding capacity, and colour measurements, further support the superior quality and technological properties of poultry meat.

Incorporating poultry meat into the diet while moderating the intake of fatty pork cuts represents a practical strategy to improve overall nutritional quality and support long-term health, emphasizing the benefits of choosing leaner meats with a healthier fatty acid profile.

References

Abdullah, A. Y., Al-Nabulsi, A., Jamama'h, M., Khataybeh, B., & Al-Ghadi, M. A. (2025). Microbial Shelf Life and Quality Assessment of Broiler Breast Meat: The Role of Cold Storage and Carcass Weight. Foods, 14(4), 640.

AOAC. (2019). Official methods of analysis of AOAC International (21st ed.). AOAC International.

Covaciu, F. D., Feher, I., Cristea, G., & Dehelean, A. (2024). Nutritional quality and safety assessment of pork meat cuts from Romania: fatty acids and elemental profile. Foods, 13(5), 804.

EN ISO 936:1998. (1998). Meat and meat products — Determination of total ash. European Committee for Standardization / International Organization for Standardization.

Estany Illa, J., Ros Freixedes, R., Tor i Naudí, M., & Pena i Subirà, R. N. (2017, May). Genetics and breeding for intramuscular fat and oleic acid content in pigs. American Society of Animal Science.

ISO 5508:1990. (1990). Animal and vegetable fats and oils - Analysis by gas chromatography of methyl esters of fatty acids. International Organization for Standardization.

ISO 1442:1997. (1997). Meat and meat products - Determination of moisture content (Reference method). International Organization for Standardization.

ISO 2917:1999. (1999). Meat and meat products - Determination of pH. International Organization for Standardization.

ISO 5509:2000. (2000). Animal and vegetable fats and oils — Preparation of methyl esters of fatty acids. International Organization for Standardization.

ISO 937:2023. (2023). Meat and meat products - Determination of nitrogen content (Kjeldahl method). International Organization for Standardization.

McCance, R. A., & Widdowson, E. M. (2014). McCance and Widdowson's the Composition of Foods. Royal Society of Chemistry.

National Statistical Office of North Macedonia. (2024). Production and consumption of meat in North Macedonia (2020–2024). Skopje, North Macedonia.

Pereira, P. M. D. C. C., & Vicente, A. F. D. R. B. (2013). Meat nutritional composition and nutritive role in the human diet. Meat science, 93(3), 586-592.

Scollan, N. D., Price, E. M., Morgan, S. A., Huws, S. A., & Shingfield, K. J. (2017). Can we improve the nutritional quality of meat?. Proceedings of the Nutrition Society, 76(4), 603-618.

Tapp Iii, W. N., Yancey, J. W. S., & Apple, J. K. (2011). How is the instrumental color of meat measured? Meat science, 89(1), 1-5.

Vongsawasdi, P., & Noomhorm, A. (2014). Bioactive compounds in meat and their functions. Functional foods and dietary supplements: processing effects and health benefits, 113-138.

Waktola, H. D., Zeng, A. X., Chin, S. T., & Marriott, P. J. (2020). Advanced gas chromatography and mass spectrometry technologies for fatty acids and triacylglycerols analysis. TrAC Trends in Analytical Chemistry, 129, 115957.

Wideman, N., O'bryan, C. A., & Crandall, P. G. (2016). Factors affecting poultry meat colour and consumer preferences-A review. World's Poultry Science Journal, 72(2), 353-366.

Wood, J. D., Richardson, R. I., Nute, G. R., Fisher, A. V., Campo, M. M., Kasapidou, E., … Enser, M. (2004). Effects of fatty acids on meat quality: A review. Meat Science, 66(1), 21–32.