



UNIVERSITÀ DEGLI STUDI DEL MOLISE

DIPARTIMENTO AGRICOLTURA, AMBIENTE E ALIMENTI

Prof. Siria Tavaniello

Campobasso, 16.09.2023

Department of Agricultural, Environmental and Food Sciences

University of Molise

Ph. D. Thesis Evaluation Report

Thesis title: **The effect of marination process on meat quality in relation to the relevance of quality management in the agrifood sector**

Author: **MSc Charles Odilichukwu R. Okpala**

Supervisor: **dr hab. inż. Małgorzata Korzeniowska, Prof.**

Co-supervisor: **Prof. dr hab. inż. Raquel P. F. Guiné**

Faculty of Biotechnology and Food Science, Wrocław University of Environmental and Life Sciences

The selection and meaning of the topic

The practice of utilizing various categories of ingredients for marination has been prevalent in both home cooking and the meat industry for an extended period. Meat treated with various marination ingredients either alone or in combination with multiple marination processes can enhance meat quality traits while also improving shelf life by reducing the growth of undesired microorganisms and lipid oxidation. As reported in the review paper, numerous scientific studies have demonstrated the important role of marination ingredients and the interest on the plant-based marination process continues to grow. The changes produced in meat due to the application of different processing techniques, preservation methods, and technologies can influence physical and chemical meat characteristics. Therefore, technologies which ensure food safety and meet the demands of the consumers without compromising the nutritional value of meat or meat products, are required. In light of this consideration, the present work aims to increase knowledge on the marinated oven grilled meat technology starting from the hypothesis that the combination of these two treatments should complement each other. Improving marination process should assure superior antioxidative properties and sensory attractiveness of thermally treated meat products. Therefore, by applying



selected spices/plant materials, the marination processes should positively affect the raw meat's physicochemical properties, alongside promising shelf durability.

Formal aspects of the work

The doctoral thesis, presented by MSc. Charles Odilichukwu Okpala entitled: “The effect of marination process on meat quality in relation to the relevance of quality management in the agrifood sector”, consists of 64 pages divided into the following parts: Summary, List of published works, Introduction, Research hypothesis, Overall aim of the study, Research methodology, Reflection on published works, Summary and recommendation for future studies, References. In the second part of the thesis are reported 8 published works, all in Scopus indexed journals. The candidate Okpala is the first author in all publications, in one of them is the only author.

The thesis is very well written in clear and concise manner. The language is comprehensive and coherent while errors and inaccuracies are relatively rare. The thesis meets the formal requirements for this type of work presented in the procedure for the doctoral degree.

Content of the work

The **introduction** is concise but exhaustive and includes useful information to understand the topic of the doctoral thesis. The **research hypotheses** are clearly stated from which MSc. Okpala has formulated an overall objective of the study followed by three specific objectives that create a logical connection between all the works presented. The schematic overview of the **research methodology** for each specified objectives such as the literature strategy, the experimental process and design and the procedures used for the surveys, give an immediate idea of the background of the studies. The **reflection on published works** does not provide additional information compared to those reported in the abstract of the related papers, however the schemes are really useful and explicative. The **summary and recommendation for the future** provide the way for future investigations that are necessary to better understand the mechanisms underlying the effects of the different substances used for the marination which are strictly linked to the presence of bioactive compounds in the marinades.

Publication 1 - Enhancing the quality of animal meat products by combining plant-based marinades and thermal processes: A treatise. Food Sci. Technol. (Accepted for publication). In this first publication the Author (s) provided a very well written and updated review of the literature regarding the effect of combining plant-based marination and thermal processes on meat quality traits. This review poses the basis for the experimental studies presented in the publications 4, 5,



and 6 in order to evaluate: i) the effect of various marination receipts on the culinary quality of different meat types including chicken breast, pork neck and beef entrecôte; i) the effect of grilling process on the physicochemical properties, antioxidant power and sensorial acceptability.

Publication 2 - Concept, Content, and Context Perspectives of Quality of Agrofood Products: Reflections on Some Consumer Decision-Making-Purchase Scenarios. *Front. Nutr.*, 2020, 7, 578941. **Publication 3** - Understanding the relevance of quality management in agro-food product industry: From ethical considerations to assuring food hygiene quality safety standards and its associated processes. *Food Rev. Int.*, 2023, 39(4) 1879-1952.

These two publications testify the in-depth bibliographic research carried out during the doctoral student's training showing the broad knowledge of the candidate in the field of his research area. In the reviews, various concepts that constitute the importance of quality management in the agrofood industry have been explored in depth, from HACCP, food safety knowledge/standards, good practices, their typologies and implementation, quality assurance/control, process/laws food inspection, risk assessment.

Publications 4, 5 and 6 are focused on the effects of various marination receipts and the oven grilling process on the physicochemical and sensorial properties and antioxidant stability of different meat types:

- chicken breast meat (Antioxidant, organoleptic and physicochemical changes in different marinated oven-grilled chicken breast meat. *Foods* 11(24), 3951; (Q1)).

This study has investigated on the effect of different marinated oven grilled chicken breast meat at different concentration on antioxidant, organoleptic, and physicochemical changes of chicken meat. In particular, the marinades involved ground constituents of cranberry pomace, grape pomace, and Baikal skullcap, subsequently incorporated with African spice, and industrial marinade/pickle. From the obtained results was not possible to delineate the best marinated oven-grilled chicken breast meat. However, the authors are convinced that an oven-grilling approach is promising method to moderate the antioxidant, organoleptic, and physicochemical value ranges of marinated oven-grilled chicken breast meat.

Questions: The TBARS values present in Figure 5 are particularly high. Why? As reported in literature values from 2.0 mg of MDA.kg⁻¹ provide the perception of rancidity in meat. What about the sensory properties?



For the future investigation it could be interesting to analyze the fatty acid composition of marinated meat before and after oven grilling.

- pork neck meat (Quality attributes of different marinated oven-grilled pork neck meat. *Int. J. Food Prop.* 26(1), 453-470; (Q2))

The aim of the study was to assess the quality attributes of different marinated oven-grilled pork neck meat. The methodology was the same as for the previous publication. The obtained results demonstrated that oven-grilling promises to moderate the range values of key quality attributes of different marinated pork neck meat samples in this study.

Questions: 1. As for the meat pH, the BS Control pre-oven grill showed a pH =6.79. How do you explain this high value of pH?

2. In Table 1 are reported higher TBARS values in the IM CP group compared to the values of the other marinade groups. Why?

- oven-grilled beef entrecote (Marinated oven-grilled beef entrecôte meat from a bovine farm: evaluation of resultant physicochemical and organoleptic attributes. *Peer J* 11, e 15116 (Q1)).

The aim of the study was to study the quality attributes of different marinated oven-grilled beef entrecôte meat. It was applied the same experimental procedure used for chicken and pork neck meat.

Questions: 1. What is the explanation for the detected differences in pH and TBARS resulting from the application of either after oven-grilling and or together with marination variants?

2. In table 1, how do you explain the numerically higher TBARS values for the AS GP 1.5% group compared to the AS GP group at lower concentration (0.5 and 1%) even if not statistically significant due to high standard error?

Publication 7- Assessing Nigerian butchers' knowledge and perception of good hygiene and storage practices: a cattle slaughterhouse case analysis. *Foods*, 2021 10(6), 1165. (Q1)).

- This work regards the good practices pertinent to beef products' handling, processing, and packaging. This work was designed to assess Nigerian butchers' knowledge and perception of good hygiene and storage practices via a case analysis of a cattle slaughterhouse. In particular, a specific slaughterhouse was selected because of its important role, from



receiving and slaughtering the cattle and processing and packaging the beef to supplying the beef to the Nsukka market (Enugu State, Nigeria).

Comments: Considering the scarcity of relevant literature about what Nigerian butchers know and challenges encountered, especially during cattle meat inspection processes, this study poses the foundation for a call for future government-funded nationwide campaigns in Nigeria, which would help enhance the meat industry regulatory standards specific to good hygiene and storage competencies and the status of butchers and slaughterhouses.

Publication 8 - Good practices contributing to cleaner food production? A Preliminary survey analysis involving Wrocław-Poland food retail sector. *Processes* 11(4), 1224. (Q2)).

Starting from the new concept of ‘cleaner food production’ which appears neither yet clearly defined nor well established, this preliminary survey analysis was performed to define how good practices would contribute towards achieving cleaner food production in the context of food retail sector. Wrocław-Poland served as a reference location, and the managers/supervisors were targeted given their expected service, experience, and expertise. Through their responses, the managers/supervisors demonstrated a capacity for understanding that good practices contribute towards achieving cleaner food production specific to the context of their food retail shops/stores.

Comments: Considering the scarcity of publication on the cleaner food production, this research work represents a valid starting point to broaden knowledge on this evolving topic.

Conclusion

The PhD thesis is well structured and well embedded into literature, showing the broad knowledge of the candidate in the field of his research area. The published results in highly ranked journals (5 publications in Q1 and 2 in Q2) prove the ability and readiness for independent activity in research of the PhD candidate Okpala. I have appreciated the schematic overview of the research methodology for each specified objectives such as the literature strategy, the experimental process and design and the procedures used for the surveys which give an immediate idea of the background of the studies. The research design and the analyses of the data are appropriate and adequate. Results are clearly presented and discussed in a thorough and critical way supported by an updated bibliography.



I declare that the doctoral dissertation meets the conditions set out in art. 187 ust. 1-4 ustawy z dnia 20 lipca 2018 r. Prawo o szkolnictwie wyższym i nauce (Dz. U. z 2023, poz. 742) for the admission of MSc Charles Odilichukwu R. Okpala to the public defense of this thesis.

Siria Tavaniello

prof. Siria Tavaniello

