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**Review of the Ph.D. dissertation**

by Aparna Porumpathuparamban Murali

entitled „Assessment of ensuring food safety among stakeholders of organic food products”  
conducted at the Department of Food Gastronomy and Food Hygiene of the Warsaw  
University of Life Sciences

Supervisor: prof. dr hab. Joanna Trafiałek

*The review was prepared in response to a letter BON.5100.20.2026 from prof. dr hab. Ewa Jakubczyk, Chair of Council of the Discipline of Food Technology and Nutrition of the Warsaw University of Life Sciences*

**The selection and meaning of the topic**

The doctoral dissertation, devoted to assessing food safety assurance among stakeholders in organic products, aligns with current and important research directions on the quality and sustainability of food systems. Given the growing consumer interest in organic food and increasing regulatory requirements, this issue is gaining particular importance from both a scientific and practical perspective. This work significantly contributes to the development of knowledge about the functioning of the organic food sector and identifies the challenges associated with maintaining high safety standards.

**Formal evaluation of the doctoral thesis**

The evaluated Ph.D. thesis presented by MSc Aparna Porumpathuparamban Murali consists of 43 pages divided to the following parts: Abstract in Polish and English, List of the

published papers included in the doctoral dissertation, Abbreviations, Introduction, Justification for choosing the topic, Aim and research hypothesis of the doctoral thesis, Materials and Methods, Results and discussion, Conclusions, References. To the descriptive part of PhD dissertation reprints of the publications constituting the doctoral dissertation preceded by Statements of the co-authors of the publications of the doctoral dissertation were added. The dissertation structure is logical and raises no objections from the reviewer. The whole dissertation consists of four scientific papers, one review and three original research papers, published in *Microorganisms*, *Current Nutrition and Food Science*, *AIMS Agriculture and Food* and *Sustainability*. The whole cycle presents well set and carried out research focused on the main topic of ensuring food safety among selected organic stakeholders. Total ranking of the cycle of the manuscripts equals IF=10.1 and total ministry points of 200. MSc. Aparna Porumpathuparamban Murali is the first author of all the presented papers. The co-authors' statements attached to the thesis indicate that the independent and separable parts of the work demonstrate significant individual contribution by MSc Aparna Porumpathuparamban Murali to the manuscripts. She participated in the conceptualization, methodology, investigation, data curation, writing – original draft preparation and visualization.

The evaluated dissertation meets the formal requirements for this type of work presented in the procedure for the doctoral degree, i.e. it is experimental and contains all the necessary chapters arranged in a typical sequence. The study is coherent and it is written in clear and understandable language.

### **Substantive evaluation of the doctoral thesis**

The collection of published and thematically related scientific articles constituting the doctoral dissertation constitutes a logical whole of consistently planned activities, which included: identification of microbiological hazards associated with organic foods (publication P1), food safety risk assessment of HACCP audit results using FMEA method among Indian organic food enterprises (publication P2), evaluation of factors influencing HACCP compliance in organic food processing enterprises in India (publication P3) and comparative assessment of food safety rules, quality management and sustainability approaches among organic food stakeholders in different countries (publication P4).

Introductory part brings crucial information on the specifics of organic food production compared to conventional food in terms of safety. MSc Aparna Porumpathuparamban Murali notes that countries may have different levels of assurance about food safety due to differences in institutional structures, enforcement capabilities, and national rules. Additionally, she emphasizes that there is little empirical data on the efficacy of food safety management systems in organic food production and processing, despite the organic food

industry's explosive growth and rising customer expectations about food safety. Further in the second chapter, titled "Justification for Choosing the Topic," she refers to publication 1 which is a coherent and informative review paper on microorganisms linked to organic foods, emphasising that biological risks continue to be a significant concern at every stage of the organic food chain, from primary production to processing and distribution. The content of the chapters "Introduction" and "Justification for Choosing the Topic" serves as a justification for the chosen research problem. They demonstrate the purposefulness of the research undertaken and demonstrate the doctoral student's excellent preparation for conducting research on the ensuring food safety among selected organic stakeholders.

The PhD candidate set one general and three specific research objectives, based on which she formulated four research hypotheses. The objective of the thesis was clearly defined, which enabled the creation of a logical structure for the work, the selection of appropriate methods, and the conduct of the research in a coherent and effective manner.

The "Research Material and Methods" chapter begins with a research plan (in the form of a table) presenting research tasks and study methods for each stage of the research, which also references specific publications. I consider this to be a very good solution and makes the work easier to read. The research material and methods are then described for each phase of the research, which included, among others, FMEA and audit. Of particular note are the statistical analysis methods including Principal Component Analysis (PCA), which was used in the cross-country comparative study to reduce the dimensionality of food safety, quality management, and sustainability indicators and to examine interrelationships among these domains. The organization of experiments and the research methods used in the doctoral thesis demonstrate the great skills and scientific workshop.

In the next chapter, Results and Discussion, the PhD candidate synthetically discussed the results of the conducted research, referring to each of the research publications included in the doctoral dissertation. The first (P1), a review article provides a comprehensive overview of microorganisms linked to organic foods. It was emphasized that biological risks continue to be a significant concern at every stage of the organic food chain, from primary production to processing and distribution. According to that study, if food safety systems are not strictly enforced, limitations on chemical control methods, the use of organic fertilisers, and limited processing techniques may increase susceptibility to contamination.

Publication 2 presents the results of the food safety risk assessment of HACCP audit among Indian organic food enterprises. This study used a modified Failure Mode and Effects Analysis (FMEA) method. The technique was divided into three steps, each with a distinct level of risk rating based on HACCP audit data. The main achievement of this experiment was that the presence of different levels of risks depending on the types and sizes of Indian organic food companies. Of particular interest are the results indicating that there was a higher conformity and reduced risks in meat industries compared to other

businesses. The study suggested that the application of risk-based assessment methodologies helps to identify food safety issues in organic food systems. Additionally, the results of FMEA method showing high and moderate risks in some key actions like hazard analysis, identification and monitoring of critical control points, corrective measures, verification processes and recordkeeping deserve to be emphasized. An important suggestion is that there should be special development in these areas to achieve robust risk management and food safety processes.

Question 1: What factors do you think influence the phenomenon that there was higher conformity and reduced risks in meat industries compared to other businesses (RTE, fruits and vegetables or dairy)?

The next part of the study presented in the Ph.D. dissertation (P3) focuses on the identifying organizational factors affecting the level of HACCP implementation in Indian organic food sector. Factors such as product type and company size were considered. Statistical analysis of the results showed that there were higher scores in HACCP compliance in companies that processed meat and ready-to-eat (RTE) foods. Moreover, companies with high HACCP compliance were large companies followed by medium-sized companies and finally, the small enterprises recorded the lowest levels of HACCP compliance in all the areas evaluated.

The last part of the thesis (P5) relates to the comparative assessment of food safety rules, quality management and sustainability approaches among organic food stakeholders in India and Italy. This study is concluded by the statement that the level of sustainability practices and food safety compliance differs among stakeholders in the organic food industry.

Question 2: The selection of Italy and India for comparative assessment was well explained in the earlier chapters of this work, although I would appreciate a brief comment on why Poland was not chosen. Are there similar studies on Poland in the available literature?

Question 3: What areas were included in the scope of "sustainability practices"? Has sustainable packaging and social and ethical responsibility been included?

Question 4: Were food safety culture activities implemented in the surveyed enterprises?

The chapter of the doctoral dissertation titled "Conclusion" presents a brief summary of the research conducted and the results obtained. Four conclusions, based on the research findings, are also included. The conclusions are substantively correct and indicate that the candidate achieved the stated goal of the thesis.

The reference list includes 60 papers. The vast majority of these are articles from the last ten years directly related to the topic of the doctoral dissertation. The literature is relevant and carefully selected to the needs of the doctoral thesis. Thus, PhD candidate demonstrated a very good knowledge of the world literature related to the research topic. The reference list allows for the identification and location of cited works. As a reviewer,

I must point out that some of the literature listed in the References section was not cited in the text (e.g., 24, 28, 29).

The PhD dissertation demonstrates good editorial skills. It contains a few shortcomings and punctuation or editorial errors, e.g., page 8 - the Polish version of the abstract was titled "Abstrkcyjny" instead of "Streszczenie", p. 17 - the title of the table should be above the table, not below it.

### **Final conclusion**

In conclusion, I would like to state that, the assessed doctoral dissertation is an original solution to a scientific problem relating to ensuring food safety among selected organic stakeholders. All experiments were carefully planned and carried out with properly selected and available methodology. The results were carefully collected, statistically analyzed, discussed and properly interpreted, which enabled them to be published in the recognized scientific journals. The scope of research performed demonstrates the ability of MSc Aparna Porumpathuparamban Murali to conduct independent research. This also confirms extensive theoretical knowledge and familiarity with analytical methods related to the topic.

The doctoral dissertation meets the conditions specified in art. 187 paragraphs 1-4 of the Act of 20 July 2018 - The Law on Higher Education and Science (Journal of Laws of 2024, item 1571, as amended). Therefore, I submit to the Council of the discipline Food Technology and Nutrition at the Warsaw University of Life Sciences a request to admit MSc Aparna Porumpathuparamban Murali to the further stages of the doctoral program.

Considering the high scientific value of the dissertation (ambitious topic and concept, scope of research conducted, significant research perspectives on the topic) I propose that it be distinguished. Doctoral thesis of MSc Aparna Porumpathuparamban Murali brings significant added value in the discipline of food technology and nutrition.

*Małgorzata Karwowska*