FOOD SAFETY ISSUES IN TRADITIONAL FOODS

Abstract

Traditional foods play a significant role in many cultures and are cherished for their unique flavors, historical significance, and association with heritage. However, the safety of these traditional foods has been a growing concern in recent times. With the growing importance of traditional foods and products, the basic principle is to create local employment opportunities, increase income and ensure the well-being of people in the community. In this context, traditional products are proving increasingly important as tools for promoting local development in a globalized world. However, ensuring the sustainability of the production of these products and increasing their diversity go hand in hand with ensuring food safety and product quality. Furthermore, defining the scope of food concepts and introducing new methods are of great importance to stakeholders to ensure food safety. In this context, it presents current practices regarding food safety risks and management systems, identifies consumer behavior, and applies innovative modern practices and new technologies to food technology for traditional products.

The people's wealthy social legacy incorporates conventional foods and food planning strategies. As the worldwide request for these foods increase numerous components must be considered. Besides, it is fundamental to create progressed approaches to analyze the combined impacts on quality and security. It is necessary to facilitate the formulation of policies and the implementation of measures to promote sustainable food systems for traditional foods. Hence, adopting standard traditional food production technologies, using advanced technologies to produce food products under appropriate conditions, ensuring food quality and safety, and

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preventing economic damage, under any circumstances and even during an ongoing epidemic, it will benefit sustainability. This chapter aims to explore the various food safety issues associated with traditional foods and their potential implications on public health.

The paper also delves into the importance of food safety awareness among consumers and producers. Implementing proper food safety practices, from sourcing ingredients to final preparation, can significantly reduce the risks associated with traditional foods.

Keywords: Food safety, traditional foods, management system, innovation, sustainability.

I. INTRODUCTION

Local products are often understood as traditional products, originating from specific geographical regions and associated with the cultural heritage of those regions. In order to promote the industrial production of these traditional foods in their territories of origin, it is essential to introduce incentive policies [1]. Among the many types of food products mentioned, traditional fermented foods occupy a unique position because they are often produced on a small scale and are widely available. Considering the growing importance of traditional foods and products, creating local employment opportunities, increasing incomes and ensuring the well- being of the people in their communities are fundamental principles. In this context, traditional products emerge as an increasingly important tool for promoting local development in our globalized world [2]. However, ensuring the sustainability of the production of these products and increasing their diversity is closely linked to ensuring food safety and product quality [3]. In addition, defining the scope of the food concept and implementing new methods is of great importance for stakeholders to ensure food safety [4]. In this context, presenting recent practices on food safety risks and management systems, identifying consumer behavior, applying innovative modern methods and emerging technologies in food technology of traditional products may be necessary. It is therefore essential to develop and validate food safety management systems (FSMS) and ensure proper implementation at each stage of the food supply chain, from primary production to end consumer [5]. The adoption of ISO 22000 and similar standards is seen as a strategic decision that not only increases the company's profits and improves the traceability of food products, but also reduces food waste [6]. Due to these different factors, the integration of these standards in the food industry can ensure product safety and improve the competitive environment for global trade [7]. In summary, this chapter presents a comprehensive review of the recent literature relating to traditional food and food safety concepts. It takes an in-depth look at modern and cutting-edge technologies while offering new perspectives on the subject.

II. CURRENT ISSUES IN TRADITIONAL FOOD SAFETY

1. **Traditional food and Food Safety Concept:** According to European Food Information Resource (EUROFIR), "traditional food is food one or more specific characteristics that distinguish it clearly different from other similar products in the same category regarding the use of "traditional ingredients" (raw materials or primary products) or "traditional composition" or "traditional manufacturing and/or processing methods" [8]. Many products around the world are recognized by the name of the region in which they are manufactured. Advertising takes into account the unique natural conditions of the region and the expertise, methods and techniques honed by generations of experienced growers in the region. Due to the long economic activity, these products are known as traditional products. Beyond their economic significance, traditional products embody the traditions, customs and culture of the local people living in their respective regions [2]. Developed countries have turned to traditional foods in order to hold on to globalization and the developing world and to preserve their values. For this reason, while product, price, promotion and positioning are in question for standard products in the marketing; in traditional foods, this order is product, positioning, promotion and price. In other words, price is the last factor to be evaluated in traditional foods [3]. Given their appealing sensory properties and potential health benefits, traditional foods are likely to survive and

remain an important cornerstone of human nutrition [9]. However, traditional foods (TF) can contain numerous allergens, contaminants, and compounds that are anti-nutrients that interfere with the absorption of essential macro- and micronutrients. Examples of these substances include saponins, tannins, phytic acid, gossypol, lectins, protease inhibitors, amylase inhibitors, anti-vitamin components, metal-binding elements, and crop substances [9]. Moreover issues associated with traditional food safety practices can arise in a variety of settings, including homes, food service establishments, restaurants and industrial processing plants [8]. Therefore the food safety concept should be emphasized in detail. The term food safety is used to refer to the dangers and risks that may make foods harmful to consumer health and is the basic condition for a product to be on the market. Food safety includes measures against all kinds of health threats arising directly or indirectly from food [10]. There are many concepts related to food safety such as food hygiene, food quality, food safety and safe food. When the content of these terms are checked, in terms of meaning apart from food safety, it could be seen that they are all connected. Although these concepts are defined differently than food safety, ensuring food safety can only be fully guaranteed by implementing these concepts. Therefore, in addition to the technical meaning of food safety, it also needs to develop definitions that encompass these concepts [4].

2. **Food Safety Hazards and Management Systems for Traditional Foods:** It is important to create incentive policies to encourage industrial production of traditional foods at home. Developed countries have adopted science-based regulations to ensure the production of food with authentic regional and traditional characteristics while ensuring safety. However, there are potential risks to public health due to possible disregard for hygiene regulations by small food processing plants and traditional food restaurants [1]. Different types of risks associated with traditional foods have been identified. These risks can be due to microbial or chemical factors, such as the presence of toxins in the plant or potentially harmful physical substances. Table 1 summarizes various food safety hazards from previous reports. The most of the hazards are of microbial origin and food safety issues have seen in developing countries rather than providing an exhaustive list of all potential hazards, known and potential emerging food safety hazards are highlighted.

The organization intends to establish a formal Food Safety Management System (FSMS) with the primary goals of ensuring food safety for consumption and effectively addressing and mitigating concerns related to foodborne illness, food poisoning and potential contamination that could lead to harm or injury. Therefore, a conventional food chain FSMS must be effectively created, verified and then implemented to ensure its effectiveness at every stage of the food supply chain, from primary production in primary agriculture to final consumption by consumer. A widely applicable approach to addressing food safety hazards, including the identification, assessment, development, validation, implementation, monitoring and verification of the FSMS, involves the use of a Critical Control Point (HACCP) system based on the principles established by Codex Alimentarius. Furthermore, over the past decades, various stakeholder groups have come up with a number of their own standards with the aim of providing guidance and direction for the development, implementation, and verification of FSMS [5, 20]. The European food industry has widely adopted various private standards including but not limited to BRC, IFS-Food, GLOBAL G.A.P, SQF and the Food Safety Certification Body (FSCC2000) [21, 22, 23] and more globally [21]. Additionally, ISO 22000:2018 Food

Safety Management System (FSMS), which is based on a risk-based approach and aligned with ISO's New High-Level Structure Annex SL, has been released to include the requirements for implementation by organizations directly or indirectly involved in the food chain [24]. Much research has been done on the implementation of food safety and quality management systems, some related to ISO 22000 [6, 7, 25, 26, 27] or other food safety management systems [28]. However, little information is currently available on the practical implementation of these systems in traditional food processing.

Table 1: Hazardous in Some Traditional Food Products for Health

Traditional Foods	Hazards	Country	References
Kokorec	Coagulase-positive Staphylococcus , E. coli	Türkiye	[1]
Raw meat ball	Salmonella spp. , L. monocytogenes , S. aureus , E. coli O157:H7, B. cereus	Türkiye	[1]
Smoked dried fish	Fungal species, of which Aspergillus flavus, Listeria monocytogenes	Nigeria	[11]
Gowe, a malted and fermented cereal beverage	*E. coli* and *Enterobacteriacae,* mycotoxin, cyanogenic compounds	West Africa	[12]
Korean foods such as Kanjang, Doenjang, Kimchi Gochujang, Jeot-gal	Mycotoxins, Biogenic Amines, Intestinal Pathogens, Nitrite, Aflatoxin, Nitrosamine	Korea	[13]
Fermented *ogi, akasa*, and *kenkey*	*Esherichia coli, Shigella*	West Africa	[14]
Nigerian *akara*	*Cronobacter sakazaki*	Nigeria	[15]
Traditional fermented food condiments *Soumbala* and *Bikalga*	*Bacillus cereus*	W. Africa	[16, 17]
Various traditional fermented foods	Chemicals, biogenic amins, mycotoxins and parasites	South-East Asia	[18]
Traditional Greek food commodities (Fermented meats, dairy products,	E. coli O157:H7, L. monocytogenes and Salmonella spp.	Greece	[19]

The correct expression is: Traditional Greek Food Commodities (Fermented meats, dairy products, plant derived products).

3. **Perceptions and Behaviors of Consumers Towards Traditional Foods:** Traditional foods are not only the origin of geographical indications, but also increase the potential for geographical indications in countries rich in traditional foods. Growing global interest in traditional foods and their potential for geographical labeling has increased awareness and awareness of these products, shaping demand and expectations [29]. Traditional

foods are products based on basic processing methods practiced for centuries and they have a shorter shelf life than modern processed foods. Perhaps the most important difference that distinguishes traditional foods from processed and packaged products is their low content of additives, with no artificial preservatives except for natural preservatives such as salt, vinegar and seasoning, and therefore, a shorter shelf life [30]. Rising consumption has made it important to determine consumer perceptions, demands and expectations of traditional foods. This is very important for monitoring and controlling the market development of these products [31]. There are many studies in the literature on the impact of traditional foods and geographical indications on rural economy and regional development [2, 32, 33, 34], consumer behaviors [35, 36, 37], and food preferences of young people [38, 39]. In addition, research on the consumption of traditional products focused on identifying consumer behavior and trends towards foods from specific regions [40, 41], the production and marketing of traditional products from the perspective of food safety [3], and grasping willingness to purchase local foods [42]. Based on 288 survey results conducted through face-to-face interviews with consumers, consumer expectations for quality, price and freshness were found to be the key factors influencing purchasing decisions for these products [42] . Another survey found that 89% of participating consumers were aware of the concept of traditional food, and 92% found traditional food delicious [43]. Seçer [44] revealed that consumers believed that changes in the manufacturing of these products and industrialization would destroy their traditional characteristics. Consumer perceptions in Turkey regarding traditional foods and the factors influencing their consumption of traditional products have been investigated. For this purpose, 1380 surveys were conducted in 7 major cities across 7 geographical regions. It was found that 87.9% of the consumers consume traditional foods. The probability of consuming traditional foods in this country was found to be approximately 98.0% [31]. According to another study, respondents emphasized the importance of using locally sourced raw materials and following well-established techniques in traditional food production [45]. It is specified that consumers believe the importance of traditional foods is not well understood and promoted. Traditional foods can be recognized by consumers as an integral part of history and culture [35]. Maybe therefore, the average of 30% of European consumers prefers local food, rising to 85% in France and 79% in Spain [46]. Moreover, recent studies have shown that consumers perceive products in the region as tastier, safer, healthier and of higher quality than similar products. These studies also demonstrate the benefits of marketing these products to local manufacturers and the environment [47].

4. **Covid-19 and Traditional Food Safety:** In recent years, increasing consumer awareness about food production and consumption has led to greater interest in food safety. It has become an important factor influencing demand for food products, especially during the COVID-19 pandemic. Crises, intentional or not, have consistently impacted consumer food shopping preferences [48]. There is no denying that the COVID-19 pandemic has dramatically changed many different aspects of our lives, including work, education, entertainment, social interactions, and even eating habits our drinking, at least in the near and immediate future [49] . After the outbreak of the COVID- 19 epidemic, the increasing trend of people's consumption of nutritious, cleanly packaged and cleanly produced foods has led to the concept of food safety being more focused [50] . In a survey conducted during the COVID-19 period, it was found that 73.5% of consumers know about the concept of food safety and 86.7% read food product labels. It has been pointed out that

the media also plays an important role in informing the public about food security during the pandemic [51]. It is revealed that during the COVID- 19 period, consumers are increasingly inclined to buy packaged food products instead of buying from open markets. In addition, they have been more diligent in sanitizing the food products they buy than they did before the pandemic. In addition, there has been an increase in consumption of fresh fruits and vegetables not in traditional foods during the pandemic compared to the past [52] . Due to the pandemic, the consumption of street food has decreased, the preference for cooked food has increased, and the awareness of hygienic practices when preparing food has also increased. In addition, women, as identified by Kamgain [53], demonstrated a higher level of understanding of food safety attitudes and practices. However, based on online surveys with a total of 1,000 participants from all regions of Turkey, it was found that consumers in general have knowledge and awareness about food safety at a high level. The study also revealed notable disparities in terms of education, age, and geographic region. In addition, it was found that the participants' food preferences were largely unchanged before and during COVID-19, but they were more concerned with the health and safety of food packaging during the pandemic [48]. In China, consumers' food safety knowledge during the COVID-19 pandemic has been found to have a notable and favorable impact on their food safety practices [54]. Regarding food businesses, it is reported that food businesses are now adopting personal hygiene measures that are more important than ever to ensure food safety during the pandemic. Improved hygiene practices and the use of personal protective equipment, such as masks and gloves, emerged as the most important aspects affected by the ongoing pandemic, which is critical to both food security and public health [55].

During the pandemic, companies have realized the application of more stringent hygiene procedures and the need to procure more personal protective equipment. In difficult circumstances, companies ensure food safety throughout the process. It should be mentioned, however, that less than half of food businesses have documented health and pandemic contingency plans [56, 57].

III. FUTURE DIRECTIONS FOR SAFETY ISSUES RELATED TO TRADITIONAL FOODS

1. **Innovative and Sustainable Approach to Traditional Food Industry Production:** Sustainable food production and food security can be defined as reliable food production systems and processes that create communities with access to safe food in an eco-friendly way environment, non-polluting nature and conscious use of natural resources and energy. This approach also protects the needs and rights of future generations [4]. The importance of providing sustainable solutions to the challenges of the world's growing population in the food sector, such as hunger, malnutrition and food insecurity is increasing day by day. In recent years, reflections of the process of digitization that have impacted the whole world can be seen in higher social models. Viewing new technologies and ideas not as threats but as helpers will facilitate the integration of these new applications into sustainable traditional food supply and production systems. In turn, this will help future generations establish a secure lifestyle with the same opportunities as today [58].

Traditional food (TF) has a strong connection with cultural heritage. With advances in modern food science, we now have a stronger foundation to explore and understand the science and benefits of TF than ever before. By conducting new scientific research on TFs, we have the potential to increase their popularity and consumption, which could lead to changes in lifestyle and eating habits, ultimately leading to the supply chain more sustainable and healthier food choices [9].

In traditional food production, it is not possible to modify the technology or ingredients of traditional food products. Technological innovation can be applied to improve food safety, product quality and convenience. Innovation in traditional food production refers to the replacement of traditional technology with an innovative process that does not affect any traditional aspect of the food product, resulting in a change or improvement basic at any stage of the process while retaining its traditional properties [59]. The implementation of traditional food processing and preservation methods can have a significant impact on society and play a key role in shaping humanity's future in terms of health, climate and sustainability. Widespread sharing of traditional foods around the world can be an essential way to promote peace, cultural diversity and prevent conflict and violence, leading to a prosperous and advanced future more for everyone [9]. The acceptance level of innovation in traditional food products varies according to the type of innovation and its impact on the product. In general, the most acceptable innovations in traditional foods are those that do not result in significant changes in the product; instead, they focus on aspects such as packaging and convenience of consumption without compromising the characteristics of traditional foods[60]. Through traditional food innovation, it is possible to improve the safety, health and overall beneficial qualities of these foods. Although the literature emphasizes the need for innovation in traditional food production and consumption processes, it also notes that research and development (R&D), the creative force of innovation, has a relatively low in the food sector [61, 62, 63]. Traditional products are usually produced in limited quantities and marketed in the regions where they are produced. However, it is well known that economic development is generated by the traditional products of a region and its impact on the development of the region, as well as its reflection on the development of the region country, cannot be achieved through the pursuit of traditional production techniques alone. The increase in economic value created in the region and the diffusion of this value throughout the country through exponential effects can be achieved through innovations in products and production processes. This is directly related to the ability of food companies to innovate in traditional production. In contrast, innovation requires a high degree of technological progress, R&D activities and, in short, additional capital [32].

Digital technologies facilitate the unified collection, recording, and immediate electronic transmission of data from a variety of sources, including databases or mobile devices, using credit wireless signal [64, 65, 66, 67]. This data can be widely stored in cloud servers, undergo processing, publicly available, and used for pattern recognition and prediction [68, 69, 70]. Digital technologies offer unprecedented possibilities to modernize official control over food safety. The transition from paper-based to digital systems enables live data recording and reporting in digital format, enabling in-depth analysis and transparency of inspection data. In addition, digital technologies enable the automation of processes through rule-based instructions, which can have a favorable

impact on the consistency of official controls [71]. Therefore digital technologies could be used efficiently for innovative sustainable traditional food production and food safety system practices. On the other hand, traditional food packaging often involves the use of non-biodegradable petroleum-based polymers, which are largely associated with significant environmental risks [72]. Nano packaging improves sustainability compared to traditional packaging. Advanced food packaging films that combine features such as UV blocking and an ethylene trap preservation system have the potential to bring revolutionary changes to traditional food production [73].

2. **Prospects on Food Safety Detection:** Food safety problems are frequently observed globally, mainly due to various food contaminants such as pesticides, pathogens, heavy metals, mycotoxins, veterinary drugs and improper use of food additives [74, 75, 76]. Until now, in practice, the quantitative detection of food contaminants has relied on sophisticated instruments such as liquid chromatography, gas chromatography, ion chromatography, mass spectrometry, or combinations thereof [77, 78, 79]. Although these methods provide accurate and stable detection, their limitations, such as heavy equipment, chemical pretreatment, and complex processes, make them impossible to rapidly detect in on-site or non-destructive [80, 81]. As mechanical, electronic, and photoelectric components are evolving rapidly, offering improved performance and smaller form factors, portable devices for biochemical sensing are emerging. These include photoelectric sensors, polymerase chain reaction (PCR) devices, microscopes, spectrometers, and chromatographs [82]. Many contemporary techniques and emerging technologies have been created and used to uncover the science of TF (Traditional Food). These methods are non-destructive, sensitive, rapid and designed for on-site detections [83]. Table 2 lists representative advanced technologies used in TFs. Current advances in scientific knowledge and technological capabilities create opportunities for scientists, industry and consumers to understand the scientific innovation behind TF (traditional foods), facilitate the transition of TF from manual practice to large-scale production and standardization [9].

Moreover, ongoing research into nanoscale science and technology, as well as advances in miniaturization and the internet of things, are dramatically improving the capabilities of biosensors. These advances are poised to play an important role in addressing the global food security challenge. However, until now, the integration of such biosensors in the food value chain, including important aspects of sustainable agriculture and the fight against food fraud, has been largely neglected until now [84]. Therefore biosensors in their applications to food safety are a research field of growing interest in traditional food sustainability.

Table 2: Recent Applications of Modern Methods and Emerging Technologies in Traditional Foods [9].

Methods	Applications
LC	Aroma and flavor analysis
E-nose	Aroma and flavor analysis
HS-SPME	Aroma and flavor analysis
SEM	Food structure analysis
Atomic force microscopy	Food structure analysis

Transmission electron microscopy	Food structure analysis
Confocal laser scanning microscopy	Food structure analysis
Light microscopy	Food structure analysis
Fourier-transform infrared spectroscopy	Chemical structure analysis
Colorimeter	Color analysis
Spectro- photometer	Color analysis
DSC	Thermophysical properties analysis
NMR	composition analysis
X-ray	Molecular structure analysis
IRT	Surface temperature analysis
Dynamic shear rheology method	Viscoelastic properties analysis
Oscillation viscometer	Viscosity analysis
Natural hydrocolloids	Bioactive compounds, food additive analysis etc.
Omics	Microbial diversity, Food composition; food allergens; bioactive food peptides/protein; process optimization; food safety and nutritional assessment analysis etc.
Machine learning	Flavor sensory; quality assessment, food texture; food classification analysis etc.

IV. CONCLUSION

One of the greatest humanitarian problems of our time has to do with food. In recent years, increasing awareness of food health and safety has driven consumers to traditional foods. The people's rich cultural heritage includes traditional foods and food preparation methods. As the global demand for these foods increases, many factors must be considered. Furthermore, it is essential to develop advanced approaches to analyze the combined effects on quality and safety. This is necessary to facilitate the development of policies and implementation of measures to promote sustainable food systems for traditional foods. In conclusion, it is envisaged that establishing a standard production technique for traditional foods, carrying out their production under appropriate conditions with advanced technology, ensures food quality and safety and preventing economic damage will benefit sustainability in all circumstances and in course of epidemic. In addition, it is believed that it will be beneficial to solve problems such as redesign traditional foods through advanced processing, creating zero food value chains, transparent communication to create trust for consumers, food waste and stakeholders' private label products.

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