Assessing the risks in food processing to a healthy living environment

Krsto Mijanović[1]

[1]University "Džemal Bijedić" Mostar

Abstract

One of the most important environmental factors, which affects the environment of a healthy life is diet. About 75% of new diseases that have occurred since 2000 in the population of Bosnia and Herzegovina have come from animals or products of animal origin. So-called zoonoses are diseases that can be transmitted from animals to humans most often through food. In addition to zoonoses, contamination of soil, water, air and plants also affects, to a large extent, directly or indirectly the environment of a healthy life. Soil, air, water and plants can be contaminated with pollutants such as heavy metals in the soil or dangerous substances that produce certain types of mushrooms, all of which are transferred in many ways to food production processes. The research define the characteristics of a healthy living environment complemented with healthy food, then explain and demonstrate, on appropriate examples, what are the hazards or hazardous places in food production and show how to reduce the likelihood of their occurrence using the standard and applicable regulations.

Keywords: *Healthy environment, health-correcting horns, zoonoses, heavy metals, standards in food production, hazards.*

Introduction

Food production technologies are moving at enormous speed, and the production process does not provide enough guarantees for a quality final product, in terms of safety of use. It can be guaranteed only for that product, which is produced, from field to table, under supervision of a competent institution or a quality laboratory. Free movement of safe food that does not have harmful effects on, the basic problem of world trade and greatly contributes to the health of the population, and their social and economic interests. (Mijanovic et al. 2018).

The choice of production methods or the impact of products on the environment contributes to perception of the quality of the product in consumers. Therefore, during product development, admissibility studies are carried out in order to evaluate the possible effects of different aspects of the production system on the perception of the quality of the product by consumers. Microorganisms as a biological hazard are the most common cause of food contamination. Therefore, great attention is paid to preventing their presence and food multiplication in hazard analysis and assessment of critical points in the process of producing food according to HACCP (Hazard Analysis and Critical Control Point). The assessment of the likelihood of the occurrence of hazards is part of the risk analysis. Risk analysis is defined as a structured and multidisciplinary approach to risk identification, elaborated in works: (Ahmetović et al., 2005.) he paperconsiders the characteristics of a healthy living environment from the point of view of food safety. It will then be explained and show, on appropriate examples, what are the points of danger or hazardous sites in food production and demonstrate how to reduce the likelihood of their occurrence by applying standards and applicable regulations.

Healthy life ambient from aspect of healthcare food according to the general provisions of the Food Law, the basis for ensuring the level of protection of people's health and food-related interests is determined, taking into account the particular diversity of food supplies including traditional products, while ensuring the efficient functioning of the internal market. Unique principles and competences are established, the assumptions for achieving a stronger

Address for correspondence:
Krsto Mijanović[1]
University "Džemal Bijedić"
Mostar
E-mail:krsto.mijanovic@unmo.ba
www.maso-international.cz

scientific basis, efficient organizational structure and procedures that will be the basis of decision-making in matters of health safety and quality of food and animal feed. This law outlines the general principles of food and feed in general, and in particular the health and safety of food and feed, at the level of Bosnia and Herzegovina. It establishes procedures for issues that directly or indirectly affect the health and quality of food and feed. This law prescribes the establishment of the Food Safety Agency of Bosnia and Herzegovina, and applies to all stages of production, processing, and distribution of food. The provisions of this law do not apply to the primary production for private household use nor to home preparation, handling or storage of food for private consumption ("Official Gazette of BiH", No. 50/04).

One of the most important factors in the healthy living environment is food quality and safety of use. Food plays a role as its ingredients allow growth, development and regeneration of the organism. For these processes, about 120 food ingredients are required. The primary role of food is based on the necessary energy for the development of basic functions of organisms at all stages of growth, development and regeneration, as well as for performing physical work. The biochemical role of food ingredients is accomplished by building numerous biologically active components in the body. The foods are introduced into microelements and vitamins, thus fulfilling their protective function. Food plays an important social role because quality and balanced nutrition is one of the basic conditions of socially acceptable behavior, high work ability and productivity. Non-rational nutrition and consumption of contaminated foods cause numerous and serious health disorders, which is why food is classified into morbogenic factors. Due to the long defect of one or more ingredients in the diet, severe immune system disorders develop, and the organism is often subject to infectious diseases. The importance of food in everyday life is crucial and its security has become an unconditional demand from consumers and competent institutions. (Tanovic et al., 2007.)

2. Healthy repair food

The concept of healthy food is a global subject of multidisciplinary research by technologists, ecologists, nutritionists and doctors. In the era of general environmental pollution, food chain disruption, lack of adequate care for municipal waste, uncontrolled use of pesticides and other environmental events, health foods are getting less and less. Therefore, in the course of technological processing, additives and preservatives must be added in order to bring the consumer closer to the parameters of correctness and taste. Healthy food is the one that meets quality, conditions of storage, preparation and distribution. All of this makes the overall health correctness of food. The technological process of producing health-healthy foods, (Plate I, Fig. 1), begins with the development of environmental relationships. (Badic et al. 2012.)

Substances such as heavy metals in soil or toxins that produce certain types of fungi can contaminate air, soil, water and plants. Organic farming is the term adopted in the EU - Regulation no. 2092/91 (Article 2). It is used because it involves the application of everything that leads to a strong balance in nature, using natural substances that protect the environment and biodiversity. Symptoms of the use of health-related food in the world's public have come to the forefront of interest called the "crisis of man's environmental relation". This crisis can be most successfully confronted by man, by rehabilitation and carefree attitude towards natural resources, which is contributed by organic food production. Air, water and land, within the boundaries that correspond to the environment of a healthy life, and the production of healthy foods without intense hemisphere, become a privilege today. That is why food production, today in politics and economy, is a priority issue and the basic goal of humanity, (Badic et al.,2012).

Agricultural crops occupy an important part of the supply chain for food and feed. The health and well-being of animals intended for Nutrition (eg. cattle, poultry and pigs) in the process of their cultivation, transport and slaughter can have significant consequences for human health. The food quality control system is mandatory quality control for all in the food production and food chain, and in EU countries it is regulated in detail. The basic principle of introducing this standard is hazard identification and hazard probability estimation, in order to calculate the risk during production, processing, production and use of food. This is a management system in which food safety is considered through the analysis and control of biological, chemical and physical hazards from input raw materials, handling, production, distribution and consumption of the end product. The HACCP system consists of two basic components: HA and CCP; HA represents a risk analysis, that is, identification of the hazards at each stage of food production and assessment of their harmfulness to human health, CCPs (critical control points) are production processes that can prevent or reduce food safety risk or reduce its impact to an acceptable level. The minimum limits for safety (minimum cooking temperature, maximum temperature in cooling devices) should be set for each critical point. Its application is widespread in the developed world, while it is legally binding in the EU (Council Directive 93/43 / EEC). The ultimate goal of HACCP is to produce as safe a healthier product as possible, (Ahmetovic et al., 2005).

Healthiness of produced food depends on the quality of packaging in which the product is packaged. By packaging, food must be protected from the effects of external influences in time to the final use. In order to maintain the quality of the food within the declared period, the packaging must have defined quality characteristics and appropriate packaging procedures must be applied. A good distribution practice ensures that the products are adequately stored and transported and handled according to the prescribed specifications. The application of the HACCP principle should ensure the preservation of food at the prescribed storage and temperature conditions, constant protection of food against contamination and spoilage, storage in secured and protected areas, correct delivery of products at a predetermined time, identification of products of inadequate quality, and effective withdrawal procedure from the market. Five keys for healthy food are:

1. Maintenance of cleanliness;
2. The separation of raw food from cooked food;
3. Complete thermal processing of food;
4. Keeping food at safe temperatures;
5. Use of healthy water and raw foods.

In its production and distribution chain (from manufacturer to consumer), all parts are equally important, and in any segment food contamination can occur. Anyone in the food handling chain must accept their responsibility to ensure that it is safe from the point of view of health safety, (Brun 2001.)

3. Product management

The research included food production facilities in the Tuzla Canton. During the preparation of the data collection process based on the survey, it was decided to solve the dilemma: domestic or foreign raw materials for food production! Polls were sent by mail to 30 factories in the Tuzla Canton area. This can improve the situation, because the data based on the survey are relevant and show the true picture of the situation in Bosnia and Herzegovina regarding food safety.

The meat industry, milk and dairy industry, alcohol and non-alcoholic beverage industry, factories dealing with fruit and vegetable processing, cake production, coffee production

were surveyed. Also, the farm of coca carcasses, farm chicken farm was also surveyed. Then the barrel and salt industry, and honey industry and flour. After data collection, processing was done, and the results are presented in (Plate I, Fig. 2 and Plate II, Fig. 3). The general hypotheses of the research were:

a) Control of food quality parameters and risk assessment has positive effects on users.
b) An efficient analysis of risk assessment in food production, the general public will be informed about food engineering in BiH.

Domestic raw materials have a good level of quality parameters, accounting for 70% of respondents, and that by purchasing domestic raw materials they improve production and economy in B&H. Manufacturers increasingly trust domestic raw materials, which they feel are safer, which confirms positive effects on end consumers.

When it comes to raw materials of foreign origin, the majority also find that satisfactory levels of quality parameters are satisfactory, but due to domestic production support, domestic raw materials are selected more in order to increase the GDP of BiH's GDP.

4. Risk assessment in food processing

Risk assessment is important because it helps in answering a number of questions: does it have, for whom and what is the likelihood of the occurrence of a hazard from introducing pesticide residues through diet, whether for a shorter or longer period of time? How pesticides can be found in foods that are consumed and consumed on a daily basis and which is recommended for beneficial effects on the health of consumers of all age groups. It is necessary that pesticide residues within the legal limits of "The maximum permitted concentrations of pesticides" are expressed in milligrams per kilogram of products (MDK) that determine the health safety of food. MDK values have not been established as toxicological limits but have been derived from extensive testing of the properties of the active substances and the behavior of their residues on the treated products. Insofar as MDK is > from permitted, laboratory research determines elements for risk assessment. This research has included general determinants of safe food production from the aspect of the origin of the raw material, but it is not dedicated to every principle individually, (Ahmetovic et al.2005)

Pre-regulatory and post-regulatory risk assessment

1. Pre-regulatory risk assessment is used prior to placing pesticides on the market according to strict criteria for the production and marketing of pesticides (EC 91/414 and EC 1107/2009) (functional changes, morphological changes, mutagenicity, carcinogenicity, immunotoxicity, neurotoxicity, reproductive effect, environmental behavior and ecotoxicology.) The objective of this assessment is to prevent:

- intoxication, potential harmful effects on workers, animals and consumers;
- harmful effects on the environment including pollution of watercourses and soil, and biodiversity, Stevanovic et al.2003).

2. Post-regulatory risk assessment is used when exceeding MDK values, and for the purpose of deciding on the need for the adoption of consumer protection measures. If MDK is exceeded, additional calculations (exposure estimates) are needed to determine if the toxicological limits that are established are already exceeded when determining the MDK value (toxicological package).

Principle of risk assessment: Exposure should not exceed the “safe amount” of toxicological reference values determined by consumer protection standards ADI (Acceptable Daily Intake Safety Permit), (Mijanovic et al., 2018).

Exposure estimation methodologies

• The mathematical models used in calculating the exposure of pesticide consumers to food in carrying out the risk assessment process is based on the assumption (1):

Input = Determined residual value x Quantity of consumed food / Body weight.....(1)

Evaluation of chronic and acute risk

Chronic Risk Assessment ADI - an estimate of the amount of chemical substance in food, expressed on the basis of body weight, which can be consumed daily throughout the life without the significant increase in the likelihood of the occurrence of hazard for consumers, (Ahmetovic et al., 2005)

The acute risk assessment of ARfD (Acute Reference Dose) - the highest established residual level determined by the deterministic approach, represents the amount of substance expressed on the basis of the body weight that the consumer can consume for a short period of time, usually from one or several meals in one day without increasing the probability of occurrence of hazard for endangering health. An acute risk assessment is performed using the IESTI (International Estimated Short Term Intake) equation (2)

IESTI = U x HR x V + (LP - U) x HR / bw. ..... (2)

U - (unit weight) the weight of the individual product (only the portion to be consumed) [kg];

HZ - (highest residue) the highest concentration of residues in the composite sample [mg / kg];

V - (variability factor) factor, which is applied to a composite sample in order to align the high level of residues in a single unit;

LP - (large portion) the highest reported consumption expressed as 97.5 percentile below the distribution curve, in the proportion of consumers consuming a certain amount per day;

bw - (bodiy weight) mean body weight for the target population [kg];

Sixteen equations - different derivatives depending on the type, size and weight of the sample (eg <25 g (pea), or> 25 g apples that can be consumed several times in one day).

Conclusion

After processing the data, the general conclusion is that food safety in the Tuzla Canton is at the middle level, to which most of the food plants belong. Other factories have a high degree of safety for the final product. A survey questionnaire comprised of 2 questions, covered the production process observed depending on the raw materials and their origin. After data processing, as presented in the results, food production in the Tuzla Canton area mostly includes domestic production (70%: 56%) in accordance with food safety standards. Findings derived from this research can be applied in food factories, because the data processed can help improve production to ideas that they have not used up to now. The challenge for manufacturers in Bosnia and Herzegovina is to pay attention to sectoral associations and to strengthen the capacity of domestic production, with the help of the local community and development projects.

The risk assessment in this study is based on a scientific assessment of the known and potential adverse effects on the health of users. A complex multidisciplinary process, consisting of four steps involving hazard identification, hazard characterization, exposure assessment and risk characterization, has been carried out. In this context, it is important

to ensure that the use of the results of a hazard probability assessment in the primary production of food and animal feed, which can affect the entire chain, is important. The benefits of carrying out such research can be systematized in the following way:

- obtaining an insight into the amount of pesticide residues in products of plant origin on the market and controlling the unauthorized use of products on products of plant origin,
- recommendation to the inspection services to intensify the control of risk samples and producers who settle them on the market,
- a warning to the manufacturer that he is using a pesticide in accordance with good agricultural practice,
- Enabling equal conditions under which producers can freely export products to the foreign market.

Future research should be based on exploring principles partially, paying attention to only taking into account production technologies with implemented food safety standards.

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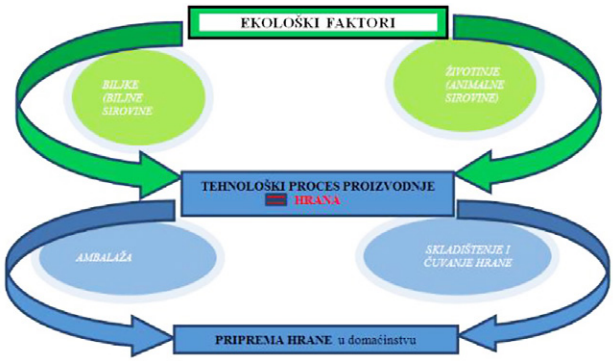


Fig. 1. Scheme of interactive connections of the technological process of food production

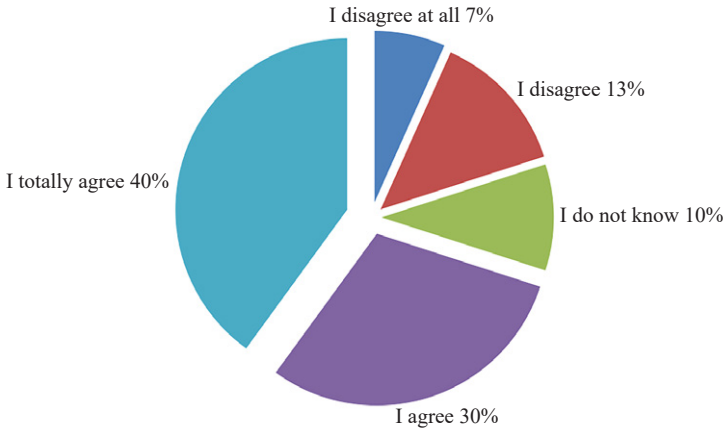


Fig. 2. Domestic raw materials

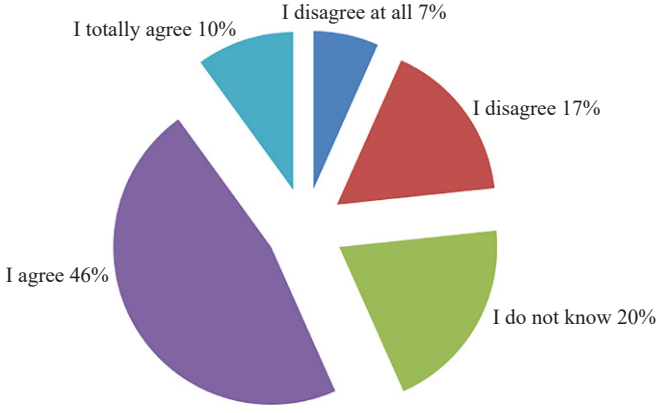


Fig. 3. Foreign raw materials

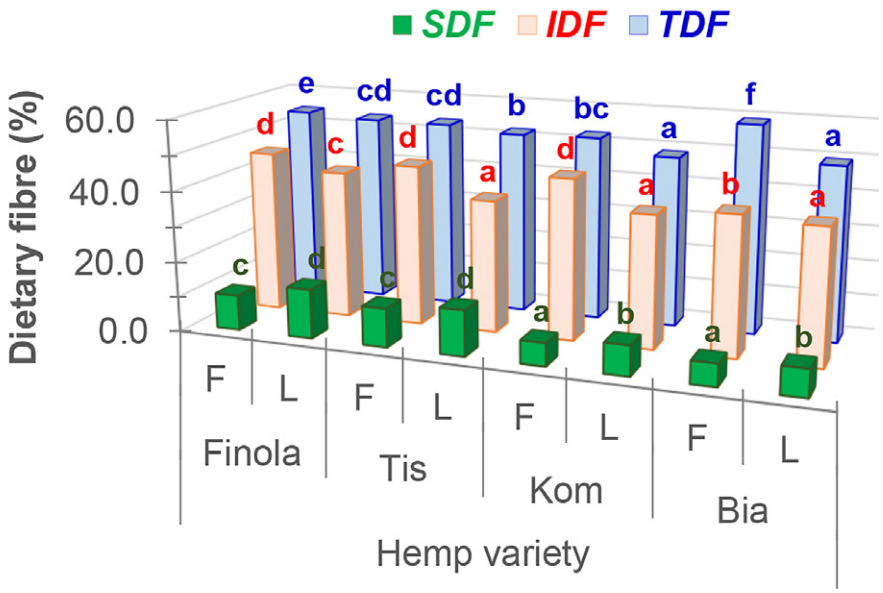


Figure 3. Dietary fibre content in hemp flowers and leaves (F and L, respectively). Hemp varieties: Fin – Finola, Tis – Tisza, Kom – Kompolti and Bia – Białobrzeskie. Columns of TDF, SDF and IDF signed by the same letter are not statistically different (P = 95%).

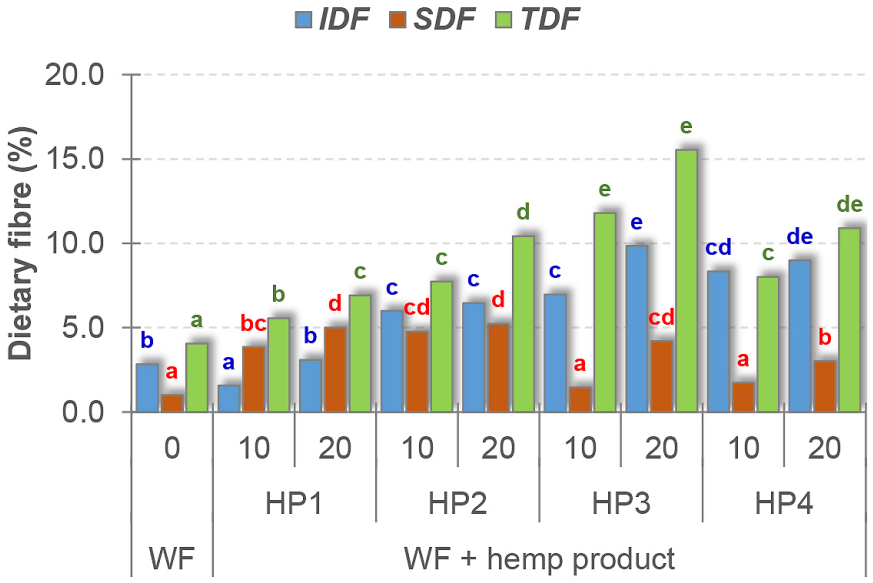


Fig. 4. Dietary fibre content in wheat and wheat-hemp pastry. Hemp products: HP1 – hemp seed flour, finely milled; HP2 – peeled hemp seed flour, coarse milled; HP3 – unpeeled hemp seed flour, coarse milled; HP4 – 50% hemp protein concentrate. Columns of TDF, SDF and IDF signed by the same letter are not statistically different (P = 95%).