

# Risk assessment in traditional production of Herzegovina ham

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*Abstract:* Production of traditional food products can pose safety problems in conditions of individual family farms, which is very difficult to monitor. Traditional production of Herzegovina ham and other foods of animal origin intended for public consumption does not follow the existing regulations on food, which poses a potential threat to human health.

Bearing in mind what we mentioned before, the aim and research tasks in this paper are aimed at the risk assessment of different contaminants in the traditional production of Herzegovina ham. Risk assessment is done on the basis of testing the Herzegovina ham in the municipality of Nevesinje. The results showed that the production of ham is not standardized, which resulted in considerable variability in the quality of the tested samples on the sensory properties. Assessment process of traditional production of Herzegovina ham found that there is a risk in production unless you don't follow the prescribed norms of production and trade of this product are not followed. By analysing of production conditions, the difference in the way of work and given results, some measures have been proposed for the goal of standardizing production, which will be helpful during making manufacturing specifications, registration of Herzegovina ham and obtaining indications of geographical origin.

**Key words:** risk assessment, Herzegovina ham.

## Introduction

Food used by human population is excellent foundation for various dangers and hazards, whether of biological, chemical or physical origin, with potentially harmful effect on human health. Food can be contaminated primary and secondary. Primary contamination is during all production stages, preparation, processing, treatment and distribution and secondary contamination occurs due to inadequate and improper storage. Intake of food that has been exposed to various dangers results in incidence of diseases in human organism.

Considering the above mentioned, subject of our research in this study was risk assessment from various contaminants in traditional production of Herzegovina ham, evaluation of properties and characteristic as well as of safety of products manufactured according to traditional production methods, i.e. products which potentially can be subject to the protection of the geographical indication of origin.

Food safety refers to ultimate reduction of risks. The European Union takes very seriously its responsibility in managing and controlling of risks

occurring in the global food market that is constantly changing. It makes decisions based on scientific studies which are transparent and available to all: the scientists, agricultural producers, food producers and consumers. At the same time, EU believes that the food safety standards would also have impact on product range and quality and not limit them. Objective is not to stifle and suppress the innovation or to homogenize the wide range of food products available on the European market, but to establish the general principles of safety to be used as basis upon which the quality and diversity can develop and prosper.

Risk can never be completely eliminated. However, by setting high standards, permanent risk assessment and use of best available independent scientific advice, European Union can by boast of good food safety policy (Markus, 2008).

Today, in global market, there is huge competition in marketing of food products. In this struggle to stay competitive, traditional products are becoming more recognized, products bearing the designation of origin or geographical indications, i.e. products whose special properties derive from

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the value of their ingredients, modes of production and processing, and the region from which they come. Higher education on nutritive and protective food properties and increased consumer purchasing power in developed countries contributed to the increase of demand for these food products which are indispensable part of culture and tradition of a region. Traditional products help promote national gastronomic and tourist-restaurant services.

According to the definition (*Regulation Council (EC) No 509/2006*) term traditional means mode of production and/or processing which is passed on from generation to generation and traditional image of food product is recognition on the market as the product that is characterized by special property or properties. *Special property* means one or several properties which clearly distinguish this product from similar products of the same category. Also, persistence of a food product, especially its form or package, how and where it is arranged and exhibited, are not considered as special property.

Even though the production of ham has relatively long history in Herzegovina, there is insufficient data on this production. In former Yugoslavia, although it was produced all around the country, there were four geographical regions where hams named after these regions were produced:

1. Dalmatian,
2. Užice,
3. Kras, and
4. Njeguš ham.

In Herzegovina, production of ham is also traditional and it takes place on agricultural holdings, mainly for own use. There is very little data in literature on traditional technology of ham production on the territory of East Herzegovina, so main source of information are producers. In regard to production method, there aren't any significant differences between the Njeguš ham, Dalmatian ham, Užice ham and Kras ham (*Joksimovic et al., 1983*) and Herzegovina ham. Main difference is in regard to sensory properties which are caused by differences in climate and duration of certain stages in production process. This refers to the salting, smoking, drying, etc.

According to *Antonic et al., (2006c)*, during production of pork ham, due to dehydration, changes in mass as well as in size, primarily length and diameter of the treated/processed musculature (piece of meat) occur. Dynamics of these changes is not the same in all production stages (salting, smoking, drying) and it primarily depends on conditions in which certain stages of production process take place. For instance, salting takes place at the cooling temperature 0–4° C, and prepared musculature is

stacked in special dishes (containers). It is certain that in such temperature conditions, all physical-chemical and biochemical process have slower rate. Also, the process of dehydration is closely associated with other processes and changes which occur within the muscles (piece of meat). In other words, intensity of dehydration and distribution of moisture in certain muscle layers influence the course of physical-chemical, biochemical, microbiological and other changes (*Antonic et al., 2006c*).

In production of Herzegovina ham, pig legs are used from animals of different breeds and ages. Body mass of pigs ranges from 100 to over 200 kg, age between 8 to 15 months. Fattening is mainly extensive and the economic effect of fattening is often neglected. Meat deriving from older animals contains less moisture and process of drying and ripening is associated with less risk.

Cutting of carcass sides is done according to the still current Rulebook on quality of slaughter pigs (Official Journal of SFRY, No. 2/85). In case of ham production, in general, legs are separated from the carcass by a cut going through pelvic joint, so that the *fovea capitis* – head of femur remains in the leg. Sacral and pelvic bones, as well as tail bones are removed. Fatty tissue on the inside of the leg is removed as much as possible, to facilitate better penetration of salt. Skin is left on the leg and feet are cut.

Discovery that the shelf life of meat can be extended by salt treatment dates from ancient times, so salting, in addition to smoking and drying, is considered as one of the oldest methods of conservation (*Antonic, 2006a*).

In Herzegovina, immediately after shaping, legs are salted. Salting is done by strong rubbing of salt over all leg surfaces. Content of salt ranges from 6–10% of the leg mass. Mainly sea salt is used, and in certain cases coarse kitchen salt.

In conditions of dry salting, i.e. procedure which is mainly applied in production of dry meat products, including the ham, first the dissolving of salt crystals in separated meat fluid occurs on the superficial area of the leg. Formed concentrated solution on the muscle surface directly effects creation of salt concentration gradient which is the driving force for the diffusion movement. Simultaneously with the diffusion of salt, also water molecules are diffusing in attempt to equalize the concentrations (*Antonic et al., 2006b*).

After salting, hams are stacked into wooden or plastic barrels, where they remain for 15 to 20 days. Stacking is done in a way to keep the *fovea capitis* – head of femur turned upwards. During salting it is

necessary to, at least once, remove the meat fluid and add slightly more salt.

Subsequent to the salting period in barrels, hams are taken out, additionally salted, slightly, and stacked on special areas (cleaned stone area, or wooden plank or concrete) for pressing. In practice this operation is most often done in the following way: above stacked hams cloth or tarpaulin is placed to protect them from dust, or even pests (rodents and insects); over the covers a plank is placed with adequate load (usually rocks) of mass from 100 to 150 kg. For this operation also a screw press can be made.

Hams are stacked placing the *fovea capitis* – head of femur facing downwards. This stage lasts until all drained fluid/juice is released and, in practice, this is usually 10 to 14 days. During the pressing, hams need to be turned at least once. Pressing stage is considered final when hams obtain flat shape, and duration of this stage greatly depends on the load (pressure). However, the main task is releasing of juices, and not forming/shaping of hams.

After pressing, excess salt is removed from the legs and certain amount of garlic, red pepper and pepper (garlic, in addition to specific flavour also has known action in prevention of bacterial growth). Legs rubbed in previously illustrated way are left to drain for couple of hours (usually overnight) and subsequently hanged in dryer where they remain for some time to drain. In the dryer equal slight air ventilation must be provided. The following is process of smoking which is at the same time drying of products.

The smoke is obtained exclusively by burning of hardwood (beech, oak or elm). Combustion should be slow (without flame) in order not to overstep the temperature of cold smoking. If the weather is more humid, smoking is done continuously, but during dry days several hours of smooking daily is enough.

Duration of smoking ranges from 30 to 40 days and after completion of this period smoking as technological stage is over, but the process of penetration of smoke particles from superficial to deeper layers continues.

In traditional approach to smoking and drying, which applies also to drying of ham, a conventional type of dryer is present, with burning stoke within the dryer and poorly solved system of slight air ventilation and influx of fresh air.

In such products it is very difficult to control the concentrations of carcinogen elements from smoke in the final product. Today, we know (Knezevic, 2007; Toroman et al., 2009) that smoke contains polycyclic aromatic hydrocarbons which give the pleasant flavour to dry meat but also are carcinogenic,

which is why smoked products are suspected as risk factor in incidence of carcinoma (Djinovic et al., 2008).

According to EU standards, maximum residue limit of 3,4 benzopyrene present in food in the form in which it is consumed resulting from the use of aromas is 0,03 µg/kg (**Council Directive 88/388/EEC**). Maximum residue limit of benzo[a]pyrene in Bosnia and Herzegovina for smoked meat and smoked meat products is 5,0 µg/kg of wet mass (*Rulebook on maximum residue limits of certain contaminants in food, official Journal of B and H, No. 37/09*).

Traditional approach to smoking and drying includes conventional dryer with stoke within the dryer and habit to produce smoke during entire drying and fermentation stage/period. In such conditions, control of the microclimate conditions of the process of fermentation, drying and ripening of products and, especially, control of the content of carcinogenic substances in the final product, is very difficult (Djinovic, 2008).

Studies of the content of benzo[a]pyrene done by controlling the process of smoking of hams where the stoke temperature was kept at the level of 300–350° C (Toroman et al., 2009), showed that the content of benzo[a]pyrene decreased in smoked meat. Mean value of the benzo[a]pyrene content in the first group was 4.18 µg/kg, when temperature of stoke was not under control, whereas at controlled stoke/furnace temperature mean value was significantly reduced to 2,818 µg/kg.

After stages of smoking and drying, fermentative and other processes are still taking place in the leg meat, and moisture is still not removed to the extent necessary for durable products. Therefore, it is necessary to continue with the gradual process of ripening and additional drying of ham. In order for these processes to continue in desired directions, it is necessary to provide room with adequate conditions for smoked products (dark room, without temperature fluctuations, uniform humidity, good air ventilation without draft, etc.).

According to Antonic (2006a), during ripening process different changes in tissues occur, resulting in drying, forming of stable colour, pleasant aroma and firm texture of the product. Basic changes of structural components, associated with process of ripening of dry meat products, include degradation, primarily of proteins but also lipids, under the action of endogenous enzymes and microbial enzymes (Antonic, 2006a).

In this regard, numerous proteolytic and lipolytic reactions are included in the process of creation of flavour and/or flavour precursors.

Ripening period lasts at least 5 to 6 months. From the beginning of the production of obtaining of the final products, the leg mass decreases by approx. 30% (total salting, smoking and ripening loss). Legs with thinner layer of adipose/fatty tissue can loose mass of up to 35%. Desirable quality properties are achieved after 10 months, and one year is considered to be optimum (Joksimovic *et al.*, 1983). There are no precise data for Herzegovina ham and these parameters are changeable depending on the holding.

## Material and methods

Objective of our study was the evaluation of Herzegovina ham produced on the territory of the municipality of Nevesinje in the years of 2008 and 2009. During the research, activities of pig breeders were monitored on pig holdings producing the Herzegovina ham. Authors of this paper have never intervened in activities of holding or gave any suggestions to the farmers.

Production took place on six individual agricultural holdings, which produce each in average annually eight hams from own production. Holdings are located on different locations of the municipality of Nevesinje.

In general, in production of Herzegovina ham legs deriving from different breeds, age and masses are used. Mass of pigs ranged from 120 to 160 kg/pig, age from 8 to 10 months. Pigs were fattened extensively, and economical results/performance in pig fattening were not in foreground.

In traditional production of Herzegovina ham legs are separated from the carcass sides by a cut going through pelvic joint, so that the *fovea capitis* – head of femur remains in the leg. Sacral and pelvic bones, as well as tail bones are removed. Fatty tissue on the inside of the leg is removed as much as possible to facilitate better penetration of salt. In most cases, skin is left on the leg and feet are cut.

Some holdings in Herzegovina, which traditionally manufacture the ham, remove the skin and adipose/fatty tissue also on the outside of the leg. In both cases it is necessary to obtain the oval shape of the leg and remove all parts which are protruding and eliminate all uneven areas on cut surfaces.

In four cases, skin and adipose/fatty tissue were left on the leg and in two holdings, skin and adipose tissue were removed from the leg. All legs had adequate oval shape without protruding parts.

Sea salt was used for salting in the amount of averagely 8% of the leg mass. After salting, legs were placed into plastic barrels for two and three weeks. Legs were stacked on wooden beech planks,

covered with tarpaulin, beech planks were placed over it carrying the load (rocks) of around 100kg of weight. Legs remained this way for about 10 days and during this time they were turned once so that the fluids/juices could drain.

After pressing, legs were washed with tap water and excess of salt was removed, and certain amount of garlic, red pepper and pepper was rubbed into legs. After this operation, legs were hanged and left overnight to drain.

In all agricultural holdings, dryers were conventional with furnace/stoke within the dryer. The air ventilation system was different and could be designated as very poor, uneven ventilation to very strong drafts recorded in two holdings.

For smoking healthy beech and elm wood was used. Smoking and duration of smoking varied in ranges from 30 to 45 days, with various intervals.

After smoking, none of the farmers had separate room for ripening of ham, but it took place in dryer, only the legs were not smoked and there was more free space and better air circulation. All hams were smoked together with other dry meat products prepared by this holding for winter.

The first sample was tested 6 month after smoking and other samples 8 to 10 months after smoking. Small number of samples was evaluated after 14 months (production from year 2008).

The ham during ripening stage, summer months, was protected by farmers in different ways.

Production of ham took place in six different agricultural holdings, in conditions which are identical to practices implemented in these holdings for generations, without any changes to this day. There were some differences in how the ham was manufactures in these six holdings, which were reflected in the obtained results.

Production conditions, differences in operation and results obtained in these six holdings were used by authors to give suggestions and recommendations of certain measures for the purpose of realizing better organization and standardized production, which could be of help in establishing of manufacturing specification, i.e. registration of the Herzegovina ham and obtaining designation of the protected geographical origin/indication.

Two samples from each holding were subject to sensory analysis. Evaluation was done by the panel consisting of seven representatives of producers and consumers of Herzegovina ham, connoisseurs of properties and qualities of this product.

In determining sensory properties, descriptive method was used (Radovanović, Popov-Raljić 2001). By this method the following was determined: exterior appearance, cross section appearance, external



colour, cross section colour, texture, smell and flavour. Maximum score was 20 points.

## Results and discussion

In production of ham the musculature of the highest quality of pig carcass was used, i.e. *m. longissimus lumborum et thoracis*. Data which refer to mean values were established for pre-slaughter pig mass, mass of warm and cooled carcasses/carcass sides are presented in Table 1.

mass during cooling 1.71%, and yield of cold carcass 79.56%.

Relatively high variation coefficients (Cv) occur because investigated carcasses were not grouped according to weight/mass groups. This can easily be observed from data on standard deviation (Sd), i.e. standard deviation from the mean value of pre-slaughter pig mass which was 138 kg (minimum value of pre-slaughter pig mass was 120 kg, and maximum 160 kg).

Also, in holdings which were included in the

**Table 1.** Data on pre-slaughter mass of pigs and yield of warm and cooled carcasses

**Tabela 1.** Podaci o masi svinja prije klanja i prinosa toplih i ohlađenih svinjskih trupova/polutki

Name/Naziv		Calculated indicators (n = 12)/ Izračunati pokazatelji (n = 12)		
		Xsr	Sd	Cv (%)
Pre-slaughter pig mass/Masa svinja prije klanja (kg)		138	12.35	8.95
Mass of primarily processed carcass/Masa primarno obrađenog trupa (kg)	Warm/Topli	111.8	10.2	9,13
	Cooled/Ohlađeni	109.8	10.06	9,17
Loss of mass during cooling/Gubitak mase tokom hlađenja (%)		1.71	-	-
Yield of cold carcass/Prinos ohlađenog trupa (%)		79.56	-	-

**Table 2.** Results of sensory evaluation of quality of pork ham

**Tabela 2.** Rezultati senzorne ocjene kvaliteta svinjskog pršuta

Number/ Redni Broj	Sample code/ Šifra uzorka	Points/ Broj bodova	% of achieved in relationship to maximum of points/ % ostvarenih u odnosu na maks. broj bodova	Class/Klasa
1	2.1.	14.35	71.50	Second/Druga
2	2.2.	15.60	78.00	Second/Druga
3	2.3.	17.35	86.75	First/Prva
4	2.4.	12.75	63.75	Third/Treća
5	2.5.	15.50	77.50	Second/Druga
6	2.6.	18.75	93.75	Extra/Ekstra
7	2.7.	17.85	89.25	First/Prva
8	2.8.	17.10	85.50	First/Prva

In Herzegovina, in production of meat products in traditional way, the predominant product is pork ham. Its regular control is very expensive and is rarely carried out in the field. Also, there are no possibilities to control of the content of carcinogenic compounds in the final product. The need to find the procedure within the process which will enable the safety of the final product still remains.

In trial conditions (Table 1) it was established that the average pre-slaughter mass of pigs was 138 kg, of primarily processed warm carcasses 111.8 kg, cooled carcasses 109.8 kg, i.e. the average loss of

trial, production was occurring in uncontrolled conditions and risk from the moment of slaughtering and suitability of such meat further in processing is present:

- ~ Time of last feeding of the animal is not considered,
- ~ Operating in unhygienic conditions, which among other things is associated with arrangement of the slaughter premises and premises for preparation of products, as well as the fact that this production is not in compliance with veterinary-sanitary regulations,

- ~ Cooling of meat (temperature of meat depends on outside temperature),
- ~ There is possibility/danger of spreading of zoonoses and other disease, etc.

The following contribute to reduction of risk:

- ~ Slaughtering of pigs is done in late autumn, when outside temperatures are low (below 10° C),
- ~ Hygiene of knives used to cut blood vessels is satisfactory,
- ~ Meat is tested/analyzed on the presence of *Trichinella spiralis*, which is mandatory obligation for over 10 years, and this is done in registered veterinary stations and clinics.

The next stage is salting and smoking of product. By the process of osmosis salt takes water from meat and in this way prevents spoiling of meat, and its antiseptic properties provide longer duration of meat. However, in addition to indispensable and positive effects, these procedures can have some adverse action.

Contrary to traditional production, in industrial meat production, chemical conservants, nitrites and nitrates are used to prevent spoilage of meat products.

Rulebook on conditions for use of food additives in food intended for human consumption (*Official journal of Bosnia and Herzegovina*, No. 83/08), stipulates a special procedure which can prohibit the use of certain additives in production of food which is considered as traditional. In Bosnia and Herzegovina, the list of traditional products has not yet been compiled, but this is expected very soon. Traditionally produced Herzegovina ham should be included in this list. Also, according to traditional production technology of Herzegovina ham, the use of food additives is not allowed, especially nitrites and nitrates.

All six agricultural holdings which are engaged in production of smoked ham and were subject of analysis, do not have any established habits of use of food additives which could be regarded as not allowed in traditional products.

Risk of incidence of bacteria *Clostridium botulinum* (botulism), in our case, is very low, due to following reasons:

- ~ Animals are slaughtered when the outside temperatures are low and pig meat is quickly cooled,
- ~ Salt is used in sufficient amounts (about 8% of the mass of pig leg),
- ~ Legs are left in the salt long enough for the salt to penetrate the inside of the leg,

- ~ Temperature at the beginning of drying is below 15 °C, which prevents growth of *Clostridium botulinum* in insufficiently ripe legs.

In the process of manufacturing of dry meat products, the content of certain substances in regulated limits must be ensured. In smoke, in addition to great number of useful compounds, there are also some undesirable substances, such as tar, soot and carcinogenic compounds from the group of polycyclic aromatic hydrocarbons. As indicator of the presence of carcinogenic smoke compounds in smoked products, benzo[a]pyrene is used, because of its greatest carcinogenic potential. In Bosnia and Herzegovina, like in European Union, content of benzo[a]pyrene in smoked meat products must be below 5,0 µg/kg. It is well known that application of high temperature of pyrolysis will lead to forming of carcinogenic benzo[a]pyrenes and, because of that, first of all, in the drying stage and smoking phase it is necessary to provide controlled temperature of furnace/stoke and sufficient air in order to create small amounts of benzo[a]pyrene.

The creation of polycyclic aromatic hydrocarbons starts at temperatures of 400° C and at temperatures of pyrolysis of 600° C they are created in significant extent. At the same time, content of polycyclic aromatic hydro carbons in smoke is higher when some organic substances (fats, proteins) are burning at the same time as wood.

All holdings, subjected to the trial, used healthy hardwood as source of smoke and made pauses during smoking.

It is recommended, where possible (building, reconstruction, etc.) to use stokes/furnaces outside the dryer. Smoke is brought to dryer through system of pipes which lower temperature of smoke, and it is possible to install wet barriers, which can collect undesirable combustion by-products of wood.

The next stage is ripening of ham. Ripening took place in inadequate premises or it continued in premises where it smoked (dryers).

From the obtained results for sensory analysis of eight hams, one sample was scored as extra class, one sample as third class, three as first and three samples as second class. The best score was given to ham which underwent ripening process of 14 months, whereas the lowest score for the ham that ripened only for 6 months. All hams which ripened for 10 months were scored as first or extra class.

Non-standardized production is one of the main observed deficits in production of ham. If producers of traditional Herzegovina ham want to improve the quality of their product and be present on the market,

either domestic or international, they need to address the issue of standardization.

One of the initial steps would be to establish the association of all interested traditional producers of Herzegovina ham as members. Associated in this way, they could more easily agree on technology and method of production (product specification), which would then be compulsory for all producers. When creating the product specification, it is necessary to do the risk assessment. This task is best done by those individuals who are familiar with specific characteristics and properties of the product being assessed, necessary procedures and available space. This would contribute to reduction of risk of contamination and obtaining a standardized product of improved quality.

Presently, there are several important differences in production technology, which need to be agreed upon in a consensus:

- ~ Skin and adipose/fatty tissue are left on the leg or removed,
- ~ Smoking method and duration,
- ~ Ripening period.

Based on two year monitoring of the situation in the field and obtained sensory results, the opinion is prevailing that traditional Herzegovina ham has skin and adipose/fatty tissue, duration of smoking of 30 to 45 days, but with obligatory improvement of the furnace/stoke system in dryers and ripening period of at least 10 months.

## Conclusion

Based on research results established in the conditions of this study and available literature data, and in accordance with determined tasks of the study, the following can be concluded:

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- Production of ham in traditional way in Herzegovina is not standardized and it takes place in inadequate hygienic conditions, this primarily refers to slaughter premises and space for reception of legs.
- Average pre-slaughter body mass of pigs was 138 kg, of primarily processed warm carcasses 111.8 kg, cooled carcasses 109.8 kg, i.e. average loss of mass during cooling was 1.71%, and yield of cooled carcass was 79.56%.
- Legs were smoked in dryers with open furnaces/stokes within the dryer and poor air ventilation system and influx of fresh air.
- Ripening of meat also takes place in inadequate premises without temperature regulation and air ventilation.
- In regard to sensory properties and the quality of final product, all analyzed samples were within the limits for this type of product, even though the quality varied considerably.
- The best properties were established in ham which was subject to the longest ripening process of 14 months, whereas the worst scored product was the one which was ripened for the shortest time (6 months).
- Hams which ripened for the period of 10 months were scored as the first and extra class.
- In evaluation of the process of traditional production of Herzegovina ham, it was established that great risk in production exists if regulated and issued norms of production and trade of this type of products are not respected.
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# Procena rizika u tradicionalnoj proizvodnji hercegovačkog pršuta

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*R e z i m e:* Proizvodnja tradicionalnih prehrambenih proizvoda može da predstavlja problem bezbednosti u uslovima proizvodnje u individualnim porodičnim gazdinstvima, koju je veoma teško nadzirati. Tradicionalna proizvodnja hercegovačkog pršuta, kao i ostalih namirnica životinjskog porekla namenjenih potrošnji ne prati postojeće propise o hrani, što predstavlja potencijalnu opasnost za ljudsko zdravlje.

Imajući u vidu napred navedeno, cilj i zadaci ispitivanja, u okviru ovog rada, usmereni su na procenu rizika od različitih kontaminenata kod tradicionalne proizvodnje hercegovačkog pršuta.

Procena rizika rađena je na osnovu ispitivanja hercegovačkog pršuta na području opštine Nevesinje. Rezultati ispitivanja su pokazali da proizvodnja pršuta nije standardizovana, što se odrazilo na znatno variranje kvaliteta ispitivanih uzoraka na senzorna svojstva. Procenom procesa tradicionalne proizvodnje hercegovačkog pršuta ustanovljeno je da postoji rizik u proizvodnji, ukoliko se ne poštuju propisane norme proizvodnje i prometa ovog proizvoda.

Na osnovu sagledavanja uslova proizvodnje, razlika u načinu rada i dobijenih rezultata, predložene su određene mere standardizovanja proizvodnje, koje će u budućnosti pomoći prilikom izrade proizvođačke specifikacije, odnosno registracije hercegovačkog pršuta i dobijanja oznake geografskog porekla.

**Ključne riječi:** procena rizika, hercegovački pršut.

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