

Hygienic and technological aspects of production of traditional fermented sausages in Istria County, Croatia

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Conference paper

SUMMARY

The rural households of the Istrian peninsula produce a variety of traditional meat products, among which belong sausages. Istrian sausages are of exquisite quality and properties, being themselves an essential part of Istrian cultural heritage. This paper describes the process of the production of Istrian sausages under traditional and controlled conditions, along with their sensory and physicochemical properties.

Key words: Istrian sausage, traditional production

INTRODUCTION

Istrian sausage is one of the most important Istrian autochthonous products which is, along with the protected Istrian dry-cured ham, awarded the Designation of Origin status. It is produced within the area of administrative boundaries of the Istria County inland, affected by the Mediterranean climate. The area is characterized by frequent winds. These are highly important for the sausage air-drying process. This research describes the process of sausage production and the properties of the product.

MATERIAL AND METHODS

Two households that implement traditional technology in the production of sausages were chosen for this research. Both households were registered and licensed sausage producers.

Sausage production

The same raw material specially prepared for the research was used in the chosen households and in the artisan pro-

cessing facility. The pigs had been traditionally fed for a year and had been grown to a live weight of about 180 kg. This amount of meat produced approx. 90 kg of sausages (30 kg in three series) following a predefined procedure and recipe. The meat used in the production was that of head, neck and shoulder blade muscles, foreskins of long back muscles, and chest cleaned of fat and connective tissue. The raw material is ground in a meat grinder (#10-12 mm). An additional 10% of bacon can be used, while it is customary to chop the added solid fat into small pieces. Such prepared mixture is added sea salt in the quantity of 1.6% -1.7%, pepper 0.2 – 0.3 %, and Istrian white wine (malvazija) with garlic extract. The wine is mulled along with the garlic, later it is pressed and squeezed, with the resulting sieved paste added to the sausage filling. The mixture needs a good kneading, after which it is stands in the cold, airy place for about two hours, and is finally filled into thin natural pig casings. Traditional Istrian sausage is of a longer, cylindrical shape and is split into 10-12 cm long pairs („murelići“), or it is of an approx. 50 cm round-shaped form. Filled sausages are taken to a traditional Istrian curing facility and undergo the drying and ripening

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Scientific and professional section

process (manufacturers A and B), and to an environment controlled ripening chamber (manufacturer C). The drying process lasts up to three weeks, in airy rooms, i.e. ripening chambers, at a temperature from 12° C to 16° C and at relative air humidity (RH) higher than 60%. The air flow (m/s) in the chambers is obtained by letting the dominant winds circulate through the openings on the opposite sides of the chamber. The controlled microclimate is attained by opening and closing the windows. In the production of Istrian sausages smoking process is not allowed. After the drying phase, the sausages can be placed on the market. Also, they can be subjected to heat treatment and later stored in fat, or are left to mature (fermentation), after which Istrian dry salami is produced. Sausage maturation takes place after sausages have been dried for up to 40 days under controlled conditions (temp ≤ 16° C; RH 60-65%). 40 day old Istrian sausages are placed on the market as dry salami.



Diagram 1. Production of traditional Istrian sausage

After production and ripening processes were completed, sensory and physicochemical tests were performed. During the production process, pH-value was estimated using a digital "Testo 205" pH meter (Germany 2011), which was poked on three different spots in each sausage sample. The results were presented as the average value of all measurements. The water activity (aw) was measured using a water activity measuring instrument "Aqualab lite Decagon" (USA, 2006). The water content was defined according to HRN ISO 1442:1997 method, protein content by determining nitrogen according to HRN ISO 937:1999 reference method, and the total fat content according to HRN ISO 1443:1999 method.

Sensory tests were performed using DLG method for dry salami (Prüfbestimmungen für DLG, 1993), with the evaluation of external appearance, cross-section, consistency, odour and flavour. The properties were evaluated on a scale ranging from 1 to 5 (1 = terribly bad, 5 = excellent), and each property was added an importance factor (external appearance = 1, cross-section = 3, consistency = 2, odour and flavour = 4). The sum of points of all values was divided by ten (the sum of importance factors), and the resulting value represents the quality grade. 12 examiners took part in the evaluation of sensory properties of Istrian sausages. The tests were performed in the chemical laboratory at Department of Hygiene, Technology and Food Safety, Faculty of Veterinary Medicine Zagreb and at Veterinary Institute Rijeka.

RESULTS AND DISCUSSION

The results of product weight loss during the ripening process of traditional Istrian sausages showed a decreasing trend. Therefore, the total weight loss of the samples ripened in the traditional curing facility was 46.6% (sample B), i.e. 44.8% (sample A), while the weight loss of sample C, which was produced under controlled conditions, was 42.70%. The observation showed that after the initial pH level of 5.90, the lowest level was measured on the 10th day of the ripening process (pH=5.09-5.12). At the end of the ripening process the measured pH levels were 5.38 (A), 5.37 (B) and 5.40 (C), whose differences were not statistically significant. The estimated pH of the examined traditional Istrian sausages was common and in line with other authors' researches (Comi et al., 2005; Salgado et al., 2005; Drosinos et al., 2005; Kozačinski et al., 2006). The water activity during the ripening process was on the decrease and its final value was 0.793 (A), 0.801 (B) and 0.822 (C).

The physicochemical changes determined in our research are typical changes of fermented sausage production process and are in concordance with the other authors' research data (Incze, 1998; Baldini et al., 2000).

Table 1 Chemical analysis of sausages

Parameters, %	Group – 40th day of ripening process								
	Sample A (n=30)			Sample B (n=30)			Sample C (n=30)		
	X ±SD	min	max	X ±SD	min	max	X ±SD	min	max
Water	22,31 ±0,21	22,09	22,65	22,69 ±0,61	22,15	23,67	31,41 ±0,93	30,17	32,53
Fat	49,14 ±0,41	48,54	49,52	46,34 ±0,36	45,90	46,70	39,50 ±0,92	38,44	40,63
Proteins	23,36 ±0,34	23,02	23,89	24,94 ±0,26	24,67	25,34	24,03 ±0,62	23,36	24,80
NaCl	3,96 a ±0,15	3,72	4,11	4,19 b ±0,20	3,90	4,42	3,34a,b ±0,06	3,29	3,44

Different values of chemical parameters were found at the end of the ripening process (Table 1), depending on where the ripening occurred: under controlled conditions or in a curing facility. The average protein level was 23.36 %, in sample A, 24.94 % in sample B, while in sample C (after ripening under controlled conditions) it was 24.03 %. The average water content at the end of the ripening process was about 22.5% in samples A and B, while sample C had an estimated content of 31%. The fat content ranged from 39.5% in sample C, which ripened under controlled conditions, up to 49.14% in sample A. The results partly coincide with former researches by Bratulić et al. (2011), when a simple random sampling of 15 traditional Istrian sausage samples showed the average water content of 23.95 %, protein level of 27.18 %, and fat content of 43.40 %. Kovačević et al. (2009) found similar results in homemade Slavonian sausages, i.e. the

average water content of 21.70 %, fat content of 42.30 %, and protein level of 22.92 %. In autochthonous products of Spain (Salgado et al., 2006), a high fat content was estimated. The sensory properties of the product were evaluated from 1 to 5 (Table 2). The sensory grades proved minor differences in product properties among sausages produced in traditional curing facilities and those produced under controlled conditions. At the end of the ripening process of Istrian sausages, the highest graded were the properties of cohesiveness, consistency and cross-section appearance, while slightly lower graded were those of odour and flavour. The traditional recipe for Istrian sausages (Bratulić et al. 2011) includes the addition of mulled Istrian malvazija with garlic, salt and ground pepper, while the sensory evaluation of samples showed an acceptability of colour, consistency, pleasant odour and taste typical of the product.

Table 2 Results of sensory test and evaluation at the end of the ripening process (N=90)

Sample	External appearance	Cross-section appearance		Consistency		Odour and flavour		Total points	Final grade
	1		3		2		4	10	
Sample A	4	3,7	11	3,9	7,7	3,6	14,4	37,1	3,71
Sample B	4	4,1	12,4	3,8	7,7	4	16,1	40,1	4,01
Sample C	4	4,3	12,8	4,3	8,6	4,2	17	42,4	4,24

In researches done by Kovačević et al. (2009), the sensory evaluation of homemade Slavonian sausage had the fat content at the cross-section as the most important parameter, while the research on sensory properties of autochthonous Croatian sausages by Kovačević et al. (2006) proved insignificant deviations in the juiciness of the product due to a too long ripening process.

CONCLUSION

Istrian sausage is a fermented, dry-cured product made of minced pig muscle and fat tissue, of specific smell and taste, with aromatic spices (Istrian white wine - malvazija, garlic, pepper) and sea salt added to it. The cross-section must have a mosaic-like appearance, made of approximately the same proportion of bright red-coloured muscle tissue and white-coloured fat content. The cross-section must be straight, without any cavities which, along with the adequate consistency, enable its

perfect slicing. The filling ingredients should be evenly distributed and well combined. Istrian salami has to be made with protein content higher than 16% and water content lower than 40%. It is moderately salty, of pleasant and gentle but never sour taste, with the scent of dry-cured pork meat and the added aromatic spices. The salami surface can be partly covered with whitish mould, formed during the maturation process.

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