# NUTRITIONAL AND MICROBIOLOGICAL QUALITY OF A TRADITIONAL ITALIAN LOCAL MEAT PRODUCT

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**Abstract – Present study provides the nutritional profile and microbiological safety of a traditional Italian dry sausage utilizing coriander and hot pepper as preservatives. Proximate composition was similar to that reported for other dry sausages. The unsaturated fatty acids accounted for 66% of the total lipids. In addition the P/S ratio (0.52), used as criteria to evaluate the nutritional quality of fat, was in the recommended range. On the other hand, this product represented a rich source of trace elements especially zinc and iron. Microbial assessment showed absence of pathogens detected in any samples.**

**Key Words – dry sausage, fatty acids, microbiological safety.**

## I. INTRODUCTION

Meat products are typical items of Italian culinary tradition which show a great variety of products. The Italian diet is in fact characterized by the consumption of a variety of "typical" foods produced in a *local dimension*, namely with specific geographical identity and produced by a small number of manufactures. The diversity in the manufactory practices produce different organoleptic and nutritional characteristic. These "local" meat products in fact are often based on ancient recipes which now attract considerable interest because of their original traditional preserving methods utilized. Traditional salting, curing and drying technologies have been used since ancient times to extend the shelf life of meat based products. Nowadays, consumer concerns about the use of potentially harmful substances like nitrate and nitrite in preserving meat, encourage producers to use health safer preserving methods. This trend is more pronounced in local manufacturers rather than in industrial products.

The purpose of the present study was to evaluate the nutritional value and the microbiological safety of an Italian local traditional meat product (dry sausage from Monte San Biagio, Lazio region), produced with coriander (Coriandrum sativum L.) locally grown and hot pepper as microbial growth inhibitors. Meat is a natural substrate for bacteria growth, resulting from primary or secondary contamination (spices and handling). Good Hygiene Practices (GHP) and Good Manufacturing Practices (GMP) must be priority in all stages of dried meat flow-chart [1]. Good slaughtering and handling practices appear to strongly influence the microbiology quality. Therefore to maintain in long time this product, is necessary to adopt conservation strategy to guarantee the food safety.

## II. MATERIALS AND METHODS

Dried sausages from Monte San Biagio (Italy, Lazio Region) are prepared with different pork muscles (ham, lomb, bacon etc.). The following spices are added: 0.5-1% coriander, 0.8-0.15% red hot pepper, 0.16-0.3% pepper, 1.8-2% salt. This mixture is macerated with 0.5% of white wine (Moscato from Terracina) for 24h in wooden containers to activate fermentation. Following, sausages are stuffed in natural casings and smoked with mastic tree wood. Before being ready to eat the sausages are matured from 21 to 28 days. Sausages were provided by four manufacturers (Mattei, Colabello, Monticellano, SVPT). Sampling was

carried out following the guidelines of Greenfield and Southgate [2].

*Methods*

*Proximate analysis* Moisture, ash, protein and lipid were determined according to AOAC methods [3].

*Cholesterol*. The analysis was carried out by enzymatic assay (Boeringer Mannheim GmbH/R-Biopharm).

*Fatty acids analysis*. Total lipid extraction was carried out according to Bligh and Dyer method [4]. The preparation of fatty acid methyl esters was performed through acid-catalysed trans-esterification with methanolic hydrogen chloride (5%) according to Christie [5]. Fatty acid separation and identification were performed on a 7890 A GC system (Agilent Technologies), equipped with a microfluid 2-way splitter for simultaneous data acquisition using two different detectors: a FID and an Agilent 5975 MS detectors.

*Minerals and trace elements* Samples were analyzed for mineral (Ca, Mg, Na, K, P) and trace element (Fe, Zn, Cu, Se) contents by ICP- OES (Optima 3200XL - Perkin-Elmer) after liquid ashing (4 mL $HNO_3$ + 1 mL $H_2O_2$) of the samples in a microwave digestion system (Milestone, 1200 Mega). Standard reference material of bovine muscle (BCR 184; Community Bureau of Reference, Brussels, Belgium) was analysed as a check on the accuracy of the analysis.

*Microbiological analysis* focused on the search of three pathogens *Listeria monocytogenes*, *Salmonella* spp. and *E. coli O157*. The analysis were performed by enzyme immunoassay with miniVidas (Biomerieux), which uses methods validated by AOAC and NF.

## III. RESULTS AND DISCUSSION

Data about proximate composition of the samples provided by the four manufacturers are reported in Table 1. Water content showed a high variability among manufacturers (SD0 4.96), thus affecting the variability in protein and lipid content (**Tab.1**). The cholesterol content was similar to that reported on other dry sausages [6].

**Table 1**. Proximate composition, minerals and trace elements of Monte San Biagio dry sausage (f.w.).

| | | Mean | SD |
|---|---|---|---|
| Moisture | (g/100g) | 26.6 | 4.96 |
| Ash | (g/100g) | 4.4 | 0.21 |
| Protein | (g/100g) | 32.3 | 2.49 |
| Lipid | (g/100g) | 34.8 | 3.79 |
| Cholesterol | (mg/100g) | 99.1 | 32.2 |
| ***Minerals*** | | | |
| Ca | (mg/100g) | 23 | 0.55 |
| P | (mg/100g) | 232 | 15.6 |
| Na | (mg/100g) | 1559 | 54 |
| K | (mg/100g) | 659 | 30.4 |
| Mg | (mg/100g) | 8.63 | 0.06 |
| ***Trace el.*** | | | |
| Fe | (mg/100g) | 1.70 | 0.26 |
| Zn | (mg/100g) | 3.67 | 0.45 |
| Cu | (mg/100g) | 0.09 | 0.00 |
| Mn | (mg/100g) | 0.04 | 0.01 |

Monte San Biagio sausage was a rich source of minerals, sodium content was in particular was in the range already found in similar products. These products were generally richer in trace elements than the industrial products, especially of zinc (3.67 mg/100g) and iron (1.7 mg/100g).

Fatty acid profile is reported in **Table 2**. The samples showed a considerable percentage of oleic acid (C18:1) followed by palmitic acid (C16:0) Among the saturated fatty acids, palmitic (21.3%). and stearic (10.8%) acids were found to be the dominant ones, while the others SFA were minor components. Concerning MUFA, oleic acid was the most represented, being 44.9% of total lipids.

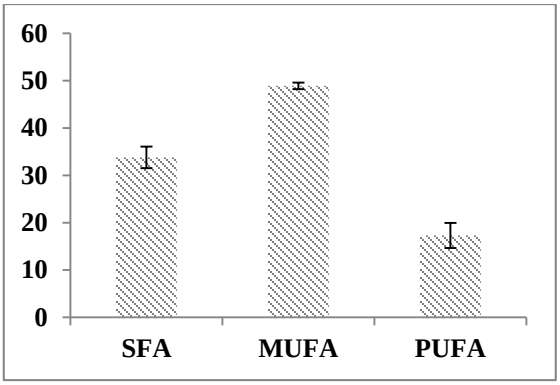
**Table 2**. Fatty acid profile (% of total fatty acids) of Monte San Biagio dry sausage.

| *Fatty acid* | Mean | SD |
|---|---|---|
| ***SFA*** | | |
| C12:0 | 0.1 | 0.01 |
| C14:0 | 1.32 | 0.1 |
| C16:0 | 21.3 | 1.2 |
| C17:0 | 0.25 | 0.07 |
| C18:0 | 10.8 | 1.1 |
| ***MUFA*** | | |
| C16:1 n-7 | 0.36 | 0.06 |
| C16:1 n-9 | 2.5 | 0.15 |
| C17:1 | 0.27 | 0.07 |
| C18:1 n-9 | 41.6 | 0.85 |
| C18:1 n-7 | 3.35 | 0.27 |
| C20:1 | 0.83 | 0.03 |
| ***PUFA*** | | |
| C18:2 | 15.1 | 2.24 |
| C18:3 | 0.69 | 0.13 |
| C20:2 | 0.63 | 0.16 |
| C20:4 | 0.92 | 0.2 |

Among PUFA linoleic acid (C18:2) was the most represented (15.1%), it was 1.5 fold higher than that generally found in the industrial products. The percentages of SFA, MUFA and PUFA are reported in **Figure 1**. As shown, the MUFA content was predominant, representing about 49% of total fatty acids. Furthermore, the unsaturated fatty acids accounted for 66% of the total fat. The high unsaturated fatty acids content could be related to the rearing characteristics (free range, fattening diet, etc.) [7]. Anyway to assess the nutritional properties of fat, the PUFA/SFA ratio (P/S) was considered. The analysed sausage showed a P/S ratio of 0.52 highlighting the high PUFA content. The recommended P/S value for healthy foods and diets ranges in fact from 0.40 to 0.65 [8].

Microbiological results showed absence of pathogens in any analyzed samples in comply with Regulation (EC) n.2073/2005, as amended Regulation (EC) n.1441/2007.

**Figure 1**. Percentages of SFA, MUFA and PUFA in Monte San Biagio sausage




## IV. CONCLUSION

This study provides a picture of the compositional figure, nutritional value and safety attributes of the Monte San Biagio dry sausage. The high variability found in macronutrient content well describe the not standardized sausage manufacture. On the other hand the high unsaturated fatty acids level could be ascribed to the free range rearing of pigs.

Our findings show the dry-sausage as a rich source of trace elements as Zn and Fe. The average content of 3 .7 mg zinc /100 g found provides about 20% of the Italian recommended daily allowance [9] per portion (50 g).

The microbiological results showed that a careful use of spices can replace nitrates and nitrites without affecting product safety[10]. The study need to increase the number of samples analyzed and to introduce all ecological variables (pH, aW, salt concentration) for enhancing evidence of food safety related to good hygiene practices. Strict adherence to GMP can improve the microbiological quality and guarantee safe of this kind of meat products [11].

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