

OVERVIEW FROM PHYSICO-CHEMICAL AND SENSORIAL POINT OF VIEW FOR ROMANIAN SIBIU SALAMI PGI

Mihaela Dana Pop

Food Consultant

E-mail: winedoctorsrl@gmail.com

Abstract

The Sibiu Salami is a dry-cured raw meat product that has been recognized and appreciated by Romanian consumers since the communist period, when it was regarded as a luxury item. Today, Sibiu Salami stands as a symbol of traditional Romanian charcuterie production and as an example of a product that has withstood the test of time, successfully combining artisanal tradition with modern quality standards. The present article provides a concise overview of the history, technological process, and physico-chemical and sensory characteristics of Sibiu Salami PGI, produced by three Romanian manufacturers in compliance with the specifications required for obtaining the Protected Geographical Indication (PGI) designation.

Keywords: Sibiu salami PGI, sensory evaluation, nutritional characterisation, technical process

1. INTRODUCTION. HISTORY OF SALAMI DE SIBIU PRODUCTION

Although the name "*Sibiu Salami*" suggests an origin linked to the Sibiu region, evidence indicates that the production of this salami began simultaneously in at least two distinct areas of Romania—namely, in Medias, near Sibiu and in the Prahova Valley region, around Sinaia. The cold and dry air of the sub-Carpathian area was ideal for slow maturation.

Thus, at the end of the 19th century, an Italian butcher named Filippo Dozzi, originally from the Friuli region of Italy, opened a small workshop in 1885, where he began producing an Italian-style dry-cured salami ("*Milano salami*"), adapting it to the local climatic conditions.

At the same time, Jozsef Theil established a production workshop in Medias, where he manufactured "winter salad" and various cured meats—products that later evolved into what is now known as *Sibiu Salami*. In 1922, Theil moved his production facility to Sibiu, at 6b Morilor Street (Heidengasse), under the company name "*Theil & Co. A.G. Salami und Selchwarenfabrik*".

This relocation facilitated the transition from artisanal to industrial-scale production, introducing controlled maturation processes and the adoption of quality standards that would later form the basis of the product's official *specifications sheet*.

These small-scale producers succeeded in turning the product, from the very beginning, into a luxury item that became a staple on the tables of Romania's wealthiest citizens.

Because its production required low-temperature conditions, Sibiu Salami was initially made only during the winter months, which is why its original name was "*winter salami*".

At the end of the 19th century, Transylvania was not yet part of Romania—it joined after 1918—but the popularity of this salami had already crossed borders, leading to its export. Shipments to the Austro-Hungarian territories were routed through the Sibiu Customs Office and export documents were stamped with the "*Sibiu Customs*" seal.

Consequently, foreign clients began referring to the product as "*Salami from Sibiu Customs*" which eventually evolved into the simplified name "*Sibiu Salami*".

By the 1930s, even the Romanian Royal Household, along with other prominent customers, placed orders under the now-established name "*Sibiu Salami*".

In 1948, all factories producing Sibiu Salami were nationalized by the communist regime and transferred to state ownership.

During the communist period, three additional factories were opened in Romania—in Medias, Bacau, and Salonta (Bihor County).

After the fall of the regime in 1990, further production units were established in Calarasi and Feldioara (Brasov County).

During the communist era, the reputation of Sibiu Salami was strengthened through participation in international fairs, including the Moscow Fair in 1951 and the Leipzig Fair in 1975.

Its international recognition continued in later years through participation in the SIAL International Exhibition in 2010 and the Piata Trade Expo Shows held in 2010, 2011 and 2012.

Since 2016, Sibiu Salami has been officially registered under the designation RO/IGP/0005/01280 (Protected Geographical Indication – PGI) at the European level. This status guarantees that the product is manufactured in Romania according to the traditional recipe and under strict conditions concerning:

- the type of meat used (high-quality pork);
- the types of spices;
- the maturation period (minimum 60 days);
- the presence of the natural noble mould covering the salami casing.

In order to comply with the product specification, Sibiu Salami may only be produced within a clearly defined geographical area that includes specific administrative-territorial units of Romania—namely, the counties of: Bacau, Brasov, Calarasi, Covasna, Ilfov, Prahova, Sibiu, and the Municipality of Bucharest.

The Romanian producer Agricola Group obtained authorization for export to the United States of America following an extensive accreditation process that lasted several years. As of 2024, the original Sibiu Salami PGI, produced in Romania, is also available on the U.S. market. However, until last year, there were reported cases of a company based in Illinois producing a so-called "Sibiu Salami" without complying with the protected designation of origin or trademark regulations. This situation highlights the ongoing challenges regarding the protection of PGI products outside the European Union and the improper use of such denominations beyond their geographically defined area of origin.

2. RAW MATERIALS, INGREDIENTS AND AUXILIARY MATERIALS AUTHORIZED FOR USE IN THE PRODUCTION OF SIBIU SALAMI PGI

2.1. Raw materials

In the past, the traditional selection of raw meat for the production of Sibiu Salami was carried out by skilled meat selectors from Transylvania, who carefully chose:

- well-developed and firm pork cuts from the ham and shoulder;
- dense dorsal fat that melts slowly during maturation,
- adult pigs rather than young ones, in order to ensure an optimal protein content and a balanced meat-to-fat ratio.

The meat was fresh, refrigerated, and processed promptly to preserve its natural properties. This artisanal approach gave each batch of salami a unique character, with slight variations in flavor and color depending on the season, breed and the pigs' rearing conditions.

Modern production standards for Sibiu Salami PGI combine this heritage with strict European food safety regulations, as follows:

- the meat must originate from EU member states (including, but not only: Romania, Spain or Germany) and must comply with high standards of traceability and food safety;
- the pigs providing the raw meat must belong to breeds renowned for their meat quality: Large White, Landrace, Duroc, or their crossbreeds;
- the meat used must be of superior quality and obtained from the ham, shoulder, neck, and brisket - muscular parts with a firm texture, with a pH between 5.6-5.8 (optimal for the development of natural fermentation cultures), a maximum moisture content of 70% and a minimum protein content of 18%, ensuring proper natural maturation without defects;
- the fat used must be firm pork backfat (from subcutaneous tissue), incorporated at a proportion of 20–25%, cut into small cubes (3-5 mm) to provide succulence and a refined texture.

According to the official Sibiu Salami PGI product specification, the raw meat used in production must consist exclusively of pork; the use of meat from other species (such as beef, poultry, or mutton) is strictly prohibited.

The reception, storage, and processing temperature of the meat must be maintained between 0 and 4°C. A comparison between traditional and modern practices regarding the quality of the meat used in Sibiu Salami production is presented in Table 1.

Table 1. Traditional and modern selection of raw meat for the production of Sibiu Salami PGI

Aspect	Tradition	PGI Standard
Origin of pigs	Local, from household farms	EU-sourced, with certified traceability
Meat selection	Handcrafted, based on visual assessment	Precise criteria: pH, protein, and moisture content
Technological process	Artisanal	Industrial-artisanal, with strict control of temperature and humidity
Texture and flavour	Variable, authentic	Uniform, with a guaranteed traditional character

2.2. Ingredients

The ingredients authorized for the preparation of *Sibiu Salami* are as follows:

- *Curing and seasoning mixture* – composed of edible salt (maximum 5%); natural spices such as pepper, allspice and garlic; and preservatives (salt combined with sodium nitrite or nitrate), in compliance with the applicable legal provisions;
- *Antioxidants* – ascorbic acid and its salts, approved in accordance with the legal requirements (Regulation (EU) No. 1129/2011, as amended);
- *Maturation agents* – starter cultures and/or bioprotective cultures, sugars (maximum 1%), in accordance with the applicable regulations. Optionally, alcohol-based maturation agents may also be used, including white wine, red wine, rosé wine, brandy, sparkling wine or dark beer. These alcoholic maturation agents are employed for limited or special edition products and must be explicitly stated in the product's name form the legal label. The maximum allowed dosage is 3%. The following ingredients are strictly prohibited in the production of *Sibiu Salami*:

- flavour enhancers (monosodium glutamate);
- acidifying agents (glucono-delta-lactone);
- colorants;
- protein additives (vegetable or animal proteins);
- any other additive that could substitute meat;
- sea salt.

2.3. Auxiliary materials

The paste obtained from the mixture of meat, fat, and ingredients is stuffed into:

- collagen casings with a diameter ranging from 60 mm to 90 mm, or
- natural horse casings, which are used exclusively for limited or special edition products. As auxiliary materials for the smoking process, only hardwood (beech, oak, or a variable mixture of beech and oak) is used, sourced exclusively from Romania. Additional auxiliary materials employed in the technological process of Sibiu Salami production include clips and/or twine, packaging materials, and labels. To obtain the noble mould coating that develops on the surface of Sibiu Salami during the drying-maturation process, cultures of noble mould are used.

These are inoculated in the form of spores of *Penicillium nalgiovensis* or as a mixture of *Penicillium* species that necessarily include *Penicillium nalgiovensis*.

3. TECHNICAL PROCES FOR OBTAINING SIBIU SALAMI PGI

A fundamental requirement is that the entire technical process for producing Sibiu Salami IGP must be carried out within the designated geographical area, as outlined in Chapter 1.

Reception and Storage of Raw Materials. Raw materials are subject to both quality and quantity controls upon reception to ensure compliance with technical specifications, verify their origin, and fulfill upstream traceability requirements.

Refrigerated (fresh) meat must be received at temperatures between 0–4 °C, whereas frozen meat must not exceed –18 °C. These temperature conditions must be maintained throughout storage, with relative air humidity in storage rooms for fresh meat maintained between 70% and 80%.

Ingredients and auxiliary materials are accepted based on quality verification, which may include document review (analysis bulletins, certificates of conformity, origin certificates) or direct analytical assessment. Storage of these materials occurs in dedicated facilities with controlled temperature and humidity, in accordance with the technical specifications.

Preparation of the Filling Paste. The initial step involves weighing the meat (minimum 70%) and lard (maximum 30%), with the same procedure applied to all additional ingredients in the recipe.

Prior to weighing, meat and lard are carefully trimmed to remove soft fat, connective tissue, ligaments, tendons, major blood vessels, and any blood-soaked portions.

Subsequently, the raw materials are drained and dried under controlled conditions (moderate ventilation, temperatures between –2 °C and 4 °C, relative humidity 75–85%) for 24 to 72 hours to reduce moisture content.

The next step consists of hardening the meat and lard to define the firmness of the raw materials, conducted under moderate ventilation at temperatures between –7 °C and –2 °C.

Once prepared and weighed, all raw materials and ingredients are introduced into a cutter vat, where they are minced to a grain size of approximately 2–4 mm. Salt and spice mixtures are then manually added, followed by antioxidants and curing agents, and thoroughly mixed to obtain a mosaic-like, granular paste.

Alcoholic curing agents are optional; if used, they are incorporated at this stage. The temperature of the filling paste must be maintained between –6 °C and 4 °C.

Acidification and Maturation. Acidification of the paste is promoted through the addition of curing agents, which carefully direct the biochemical maturation process to ensure the final product poses no health risks.

Added sugars facilitate fermentation by influencing the final pH.

The pH, shaped by sugar oxidation and partial hydrolysis of triglycerides, determines the acidification of the paste, which is further enhanced by curing agents through enzymatic oxidation of fatty acids released during lipolysis in maturation.

Filling of Casings. The filling of casings is carried out using a filling machine, which injects the prepared paste into natural and/or collagen casings, conditioned according to the technical specifications. The sausages are then formed by clipping or manual fastening and subsequently hung on racks or mobile frames for further processing.

Drying and Cold Smoking. The drying step is designed to prepare the casings for smoking and is conducted over 24 hours at a temperature of 10 °C under moderate ventilation. Given the preference of Romanian consumers for a smoked flavour, Sibiu Salami IGP is subjected to a smoking process, which also contributes to the product's shelf life. Smoking is performed at low temperatures (9–24 °C) with a relative air humidity of 85–92%, using exclusively hardwoods (beech, oak, or a blend of the two), and the duration of smoking ranges from 3 to 10 days.

Curing and Drying. Curing and drying constitute the most critical stages of production, during which the final product achieves its characteristic shape, firm yet elastic texture, granular and compact structure, and distinctive taste and aroma associated with cured meat.

During this phase, the principal chemical components of the meat—sugars, proteins, and fats—undergo hydrolytic and oxidative transformations influenced by physical, chemical, biochemical, and microbiological factors. The paste acquires a red hue due to the formation and stabilization of microbiologically derived pigments, the hardening of the filling, and the development of specific consistency, which is also facilitated by protein denaturation and solubilization.

The characteristic taste and aroma of Sibiu Salami emerge through complex biochemical processes, including sugar fermentation, protein hydrolysis (yielding free amino acids and peptides), and lipid hydrolysis and oxidation (producing free fatty acids and carbonyl compounds). Additionally, salt, smoke-derived compounds, and previously incorporated spices contribute significantly to the final sensory profile. The drying and curing operations extend over a minimum of 60 days, with the maximum duration depending on sausage diameter. These processes are conducted in climate-controlled maturation storage, at temperatures between 8 °C and 24 °C, following the detailed procedural steps outlined below:

- ✓ seeding with noble mould (*Penicillium nalgiovensis*) by spraying method;

- ✓ settling for mould starting to growth – 6 hours;

- ✓ the formation of mould mycelia on each salami occurs over a period of 10–12 days. During this stage, the mould metabolizes nutrients present in the salami paste, including sugars, proteins, and lipids, producing metabolites that contribute to the product's characteristic flavor. Mould also plays a protective role by maintaining the salami's ruby-red color and extending shelf life through the establishment of a microbiome on the casing, which inhibits rancidity and the growth of contaminant microorganisms;

- ✓ curing and brushing of the salami are performed between 25- and 45-days following seeding, once the sausages are fully covered with mould mycelia.

✓ By the end of this high-humidity curing period, conducted at temperatures of 10–15 °C, the mould typically exhibits white, yellow-white, or off-white coloration.

✓ final drying is conducted under the same temperature conditions (10–15 °C), with a gradual reduction of relative air humidity in the maturation rooms. This process continues until the end product achieves the standard maximum moisture content of 30%.

The entire production process of Sibiu Salami IGP requires a minimum of 70 days, with the maximum duration depending on the diameter of the sausages. The final product must conform to the physical, chemical, and microbiological characteristics specified in the IGP regulations.

Storage and Packaging. Sibiu Salami IGP is stored in climate-controlled rooms at temperatures ranging from 0 to 14 °C and relative humidity of 70–80%.

The salami is marketed as whole pieces, with the casing covered in noble mould and each piece individually wrapped in permeable, micro-perforated plastic film.

Sliced Sibiu Salami is prepared by first removing the casing, followed by slicing and portioning into packages of various sizes.

Slicing is conducted under vacuum or in a protective atmosphere to minimize exposure to air, thereby preserving the characteristic colour and sensory qualities of the product.

4. NUTRITIONAL CHARACTERISATION OF SIBIU SALAMI PGI

The tasting of Sibiu Salami was conducted during a sensory analysis course held in October, which evaluated three salamis produced by three different manufacturers, all of whom are members of the Sibiu Salami PGI Producers Association. For data protection purposes, the salami samples were coded with numbers known only to the organizers.

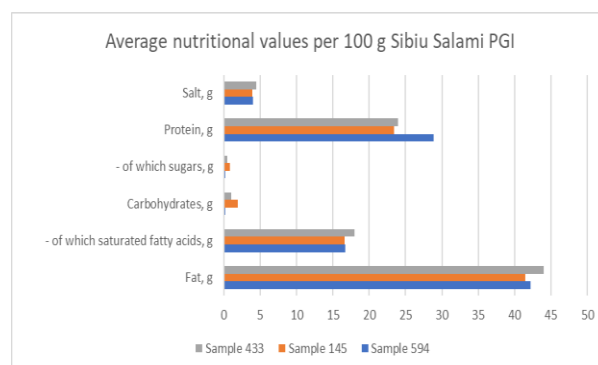
The nutritional values, obtained from the nutrition tables provided on the label of each Sibiu Salami PGI product, are presented in Table 2.

Table 2. Nutritional declaration for 100 g Sibiu Salami PGI

Average nutritional values per 100 g	Sample 594	Sample 145	Sample 433
Energy value: kJ/kcal	2 053 / 495	1 987 / 475	2 084 / 498
Fat, g	42.2	41.5	44
- of which saturated fatty acids, g	16.7	16.6	18
Carbohydrates, g	0.2	1.9	1
- of which sugars, g	0.2	0.8	0.5
Protein, g	28.9	23.4	24
Salt, g	4	3.87	4.5

For a graphical representation of these data, Figure 1 was created, illustrating the macronutrients present in the three Sibiu Salami PGI samples analysed.

Figure 1. Average nutritional values per 100 g of Sibiu Salami PGI



The highest nutrient content in Sibiu Salami PGI is provided by fat, which exceeds 40%, followed by protein content, ranging between 23–29%. The carbohydrate and sugar contents are negligible, as they originate solely from sugars added during the technological process to support the growth of fermentation and maturation bacteria and moulds. Although the salt content reaches nearly 4%, it is not objectionable, as the flavours developed during the fermentation–maturation process is perfectly balanced and enhanced by this level of salt.

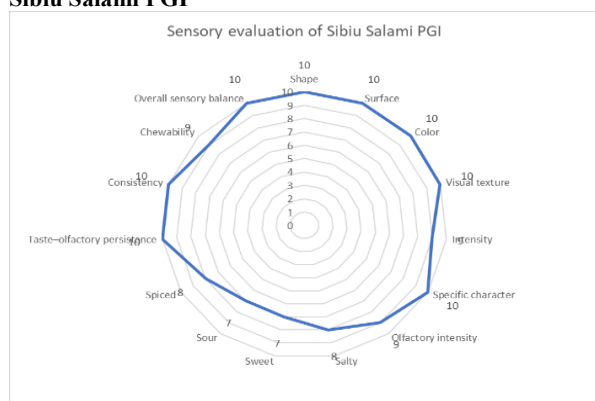
5. SENSORY PROFILE FOR SIBIU SALAMI PGI

The sensory profile of Sibiu Salami PGI was established through the completion of a tasting sheet by a professional taster for a given Sibiu Salami sample, as shown in Table 3, along with scores ranging from 0 to 10 assigned to each sensory attribute.

Table 3. Professional tasting sheet for Sibiu Salami PGI

Criteria	Evaluated Attribute	Score (0–10)	Descriptive Comment
External examination	Shape	10	Cylindrical, regular, slightly elongated; ends well-closed, without deformities
	Surface	10	Surface covered with fine, adherent noble mould, whitish-grey in colour, with a pleasant aroma; no green spots or excessive shine
Visual examination of the slice	Colour	10	Uniform ruby-red; fat is white and evenly distributed throughout the meat
	Visual texture	10	Compact, homogeneous, without air gaps; no fat clumps; edges slightly drier
Olfactory examination	Intensity	9	Pleasant, pronounced, and balanced aroma
	Specific character	10	Notes of matured meat, delicate hints of smoke, noble mould, and subtle spices
	Olfactory intensity	9	Excellent, long-lasting, without rancid, sour, or smoky off-notes
Taste–olfactory examination	Salty	8	Harmonious, not excessive
	Sweet	7	Slightly sweet notes, resulting from prolonged maturation
	Sour	7	Light, pleasant, contributes freshness to the taste
	Bitter	0	Absent
	Spiced	8	Balanced; subtle notes of pepper and coriander distinguishable
	Persistence	10	Balanced; subtle notes of pepper and coriander distinguishable
Texture	Consistency	10	Firm but not hard, slightly elastic under pressure; slowly returns to original shape
	Chewability	9	Easily sliced and chewable, without disintegrating
Overall evaluation	Sensory balance	10	Harmonious product with complex gustatory–olfactory aromas; rounded finish, slightly buttery

Based on the assessment of these sensory attributes, a graphical sensory profile was also created, presented as a spider (radar) chart, as shown in Figure 2.

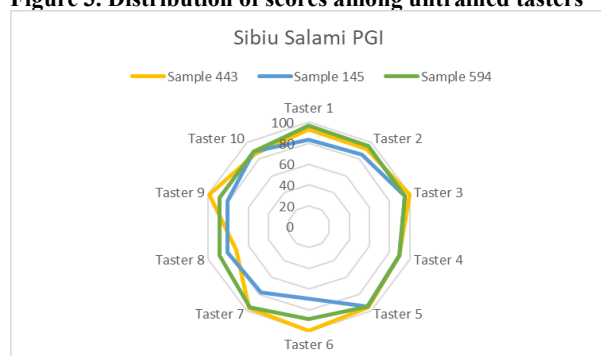
Figure 2. Descriptive and analytical sensory evaluation of Sibiu Salami PGI

The scores obtained from untrained tasters, who had attended a sensory analysis course, for the three types of *Sibiu Salami PGI* analysed, are presented in Table 4.

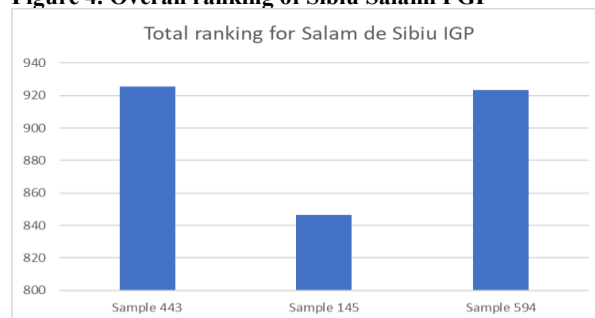
Table 4. Sensory analysis of Sibiu Salami PGI by tasters

Sibiu Salami PGI	Samples 443	Samples 145	Samples 594
Taster 1	93	83	97
Taster 2	92	86	96
Taster 3	100	96	96
Taster 4	90	90	90
Taster 5	96	94	94
Taster 6	100	69	89
Taster 7	97	78	96
Taster 8	72	81	89
Taster 9	99	81	89
Taster 10	87	89	89
Total	926	847	923

The spider (radar) chart created from these values, presented in Figure 3, shows a harmonious distribution of scores among the 10 untrained tasters, indicating that with practice they could develop into trained tasters with highly refined sensory acuity.

Figure 3. Distribution of scores among untrained tasters

As observed in Figure 4, the most appreciated Sibiu Salami PGI sample was 443, with sample 594 ranking very closely behind, only 3 points lower. Sample 145 received a lower score due to a significantly shorter maturation period compared to the other samples, which greatly affected its sensory evaluation.

Figure 4. Overall ranking of Sibiu Salami PGI

6. CONCLUSIONS

Sibiu Salami is often associated with Romanian culinary refinement and is appreciated both domestically and internationally, representing a product perfectly balanced between the flavors of matured meat, smoke, and spices. The noble mold that develops on the surface of the salami contributes to the aromatic complexity without introducing invasive or unpleasant notes in the final product. Together with other biochemical processes occurring during maturation, it helps form a texture that is both soft and firm, providing a pleasant in-mouth sensation of slow melting. The taste–olfactory profile is refined and elegant, resulting in a final product with an authentic Romanian identity.

From the analyzed samples, it can be observed that although the PGI specification recipes are followed, there are certain differences in nutritional parameters. However, these differences fall within the established requirements and do not affect the analyzed sensory attributes. The main factor influencing the production of a high-quality final product is the maturation period: the longer the maturation, the more complex and developed the flavor profile becomes.

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