

SUMMARY

Ph.D. THESIS

RESEARCH ON THE INFLUENCE OF ADDED FIBRE ON THE QUALITY OF MEAT PRODUCTS

Key words: *dietary fibers, meat quality, meat pasta, innovative meat products*

In the current context of the transition towards healthier food systems, the focus on sustainability and durability, as well as the shift towards prevention, has prompted the food industry to take steps towards reformulation, innovation, and nutritional optimization. The major changes in consumer behavior over the past few decades, marked by a concern for a balanced, sustainable, and functional diet, have prompted the food industry to rethink the structure of traditional products, partially or completely replacing some classic components with plant-based ingredients.

Moreover, the increasing expectations of consumers regarding product composition, fiber intake, reduction of synthetic additives, and caloric content are driving a strategic reorientation of meat industry processors to improve the nutritional profile of meat in relation to its reduced fiber content.

Dietary fibers, recognized for their physiological benefits, water retention capacity, impact on texture, and contribution to the feeling of satiety, have become essential components in the development of innovative products. Their use in meat-based products opens up interesting perspectives both nutritionally and technologically, especially when aiming to enrich the nutritional profile and maintain the desired sensory characteristics without compromising quality.

In this context, dietary fibers have acquired an essential role not only from the perspective of improving nutritional intake but also as functional agents capable of modifying the rheological, sensory, and stability properties of foods.

The PhD thesis "***Research on the influence of fiber addition on the quality of meat products***" was structured in two parts, which include seven chapters, 20 figures, 45 tables, and 336 bibliographic titles, and which integrate the study of literature on the addressed topic, original research, results obtained, conclusions, and bibliographic references consulted in the development of the thesis.

In the first chapter, recent developments regarding global and national meat production and consumption were analyzed, highlighting the imbalances between different geographical regions, current trends of increasing or decreasing

consumption, and medium- and long-term projections regarding global meat demand.

The second chapter presents the concept of meat in relation to its intrinsic quality characteristics – nutritional, sensory, and technological – and the significant impact that meat consumption can have on consumer health and the environment.

In the third chapter, the issue of improving the functional and technological value of meat products through the addition of plant fibers was addressed, detailing their sources, relevant physicochemical properties, and the positive effects on the composition and technological performance of the final products.

The second part, which includes original contributions, consists of four chapters presenting the purpose, organizational framework, and research methodology, the technology for producing meat pasta with added dietary fibers, and the results obtained in the qualitative evaluation of the batches, highlighting the differences imparted by the three types of fibers and the different percentages introduced.

The fourth chapter argues the purpose, objectives, and motivation of the research and describes the conduct and organization of the research, presenting the working methodology and the experimental plan for the practical implementation and qualitative analysis of the meat pasta batches.

The study aimed to develop and characterize innovative fresh pasta varieties based on pork meat, enriched with plant fibers (apple, beetroot, and psyllium), formulated to achieve an improved nutritional profile and acceptable technological and sensory properties. The research endeavor aligned with current concerns regarding sustainability, the secondary utilization of plant resources, and the reduction of food waste, while simultaneously ensuring a functional fiber intake in the daily diet.

In the fifth chapter, the technology for obtaining meat pasta with added dietary fibers was detailed by describing the raw and auxiliary materials used, developing the technological scheme, and going through the necessary processing stages to obtain experimental batches, in order to ensure the reproducibility and applicability of the process.

The research results, presented in chapters six and seven, integrate the most relevant aspects regarding the influence of adding plant fibers on the physicochemical, compositional, sensory, technological, and microbiological characteristics of meat pasta, contributing to a descriptive evaluation.

The experiment was structured to produce 10 distinct batches: one control batch (LM), made from pork meat (shoulder), durum wheat flour (semolina), and

auxiliary materials, and nine experimental batches obtained by adding plant fibers in proportions of 3%, 6%, and 10% for each tested fiber source (apple fibers – FM, beet fibers – FS, psyllium husk – TP). The products were formulated as raw, refrigerated pasta, and the evaluations included physicochemical analysis (pH, chemical composition, water activity), determination of textural properties (through Warner Bratzler cutting tests and texture profile analysis tests), determination of color parameters, evaluation of technological parameters (boiling time, water absorption, cooking losses), microbiological analysis, and descriptive sensory evaluation conducted on cooked samples to closely simulate real consumption conditions and the final consumer's perception of the product.

The chemical composition of meat pasta was significantly influenced by the type and level of added plant fibers, with the most notable effects observed on the content of fats, carbohydrates, and dietary fibers. Apple fibers favored the retention of fats and polyunsaturated fatty acids, while psyllium led to a reduction in lipid content and an increase in fiber intake, indicating high nutritional potential. The amino acid profile remained generally stable, except for glutamine, and the variations suggested a protein dilution effect at moderate additions, followed by a trend of stabilization at higher concentrations.

From a textural point of view, instrumental and sensory tests have shown that psyllium husks resulted in a general reduction in hardness, attributed to the high content of soluble mucilages with a high water retention capacity. These batches were characterized by a grainier, slightly sticky, and less elastic texture, but sensorily balanced, making them the most appreciated by the panel of evaluators. In contrast, the batches with beet fibers, although technologically stable, were considered harder, with a sandy and less pleasant consistency, thus receiving lower hedonic scores. Apple fibers had an intermediate influence, generating an acceptable consistency but with an acidifying impact on the final pH and a slight reduction in the product's hydration capacity.

Regarding pH, the decreasing trend was observed for all batches, depending on the fiber concentration, with minimum values recorded in the batches with apple fibers (pH = 5.33 at 10%), while those with psyllium husk maintained a high pH, close to the control (pH = 5.82–5.86).

The color of the meat pasta was significantly influenced by the type and concentration of the added plant fiber, due to the intrinsic color of each type of fiber and the interactions with the meat pigments. Apple fibers reduced the brightness (L^*), giving the product a darker shade, while beet fibers intensified the yellow component (b^*), and psyllium maintained a color close to that of the control batch.

The microbiological quality of the meat pasta batches were within acceptable limits for the total number of germs, coliform bacteria, yeasts, and molds, and the test for identifying the genus *Salmonella* spp. was negative for all analyzed samples. The addition of vegetable fibers did not promote the development of spoilage microflora, suggesting good microbiological stability of the product under the applied refrigeration conditions.

Based on the descriptive and comparative results obtained, it was observed that meat pasta represents a product with positive qualitative attributes, from a physicochemical, technological, and microbiological point of view, as well as with high sensory acceptability. In addition, the incorporation of dietary fibers into the matrix of the control batch to enrich nutritional and functional quality significantly influences the quality of raw meat pasta; psyllium husks represents a promising solution for formulating products with an optimal nutritional profile and attractive sensory characteristics. The study provides a solid foundation for the development of innovative functional varieties in the category of refrigerated meat products, impacting both consumer health and the sustainability of the food industry by utilizing fiber-rich plant by-products.