

„ION IONESCU de Ia BRAD” UNIVERSITY OF AGRICULTURAL  
SCIENCES AND VETERINARY MEDICINE  
IAȘI  
FIELD DOCTORAL: ANIMAL HUSBANDRY  
SPECIALIZATION: POULTRY AND FUR ANIMALS EXPLOITATION  
TECHNOLOGY

Doctoral Student,  
eng. Lilica BARBU, (married COCLEA)

# PhD DISSERTATION

Scientific leadership,  
Prof. Ioan VACARU-OPRIȘ, PhD

Iași, 2010

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# **PhD DISSERTATION**

CONTRIBUTIONS TO POULTRY MEAT  
QUALITY KNOWLEDGE AND IT'S  
SUPERIOR DEVELOPMENT IN THE  
FRAMEWORK OF  
“TABCO-CAMPOFRIO” SA TULCEA

Iași, 2010

## ABSTRACT

In the food supply of the population with products with high biological value an extremely important role is awarded to the animal origin products, and among those, meat and meat by-products are prevalent. Among the utilized meat sources chicken meat takes a special place, since it shows characteristics that makes it not only very nourishing, but dietetic as well.

In the repoted context the concerns for the superior development as products of the chicken meat have increased, being demanded by an increasingly open market for such products.

In our country the research to obtain chicken meat products, with or without protective membrane, has been initiated 25-30 years ago by the team led by *Vacaru-Opriș, I.* After 1989 has been a stagnation of the scientific research on this topic, for starting with 2000 to restart the research at a higher level. This is how we explain our interest in elucidating some aspects related to the superior refinement of the chicken meat in Romania.

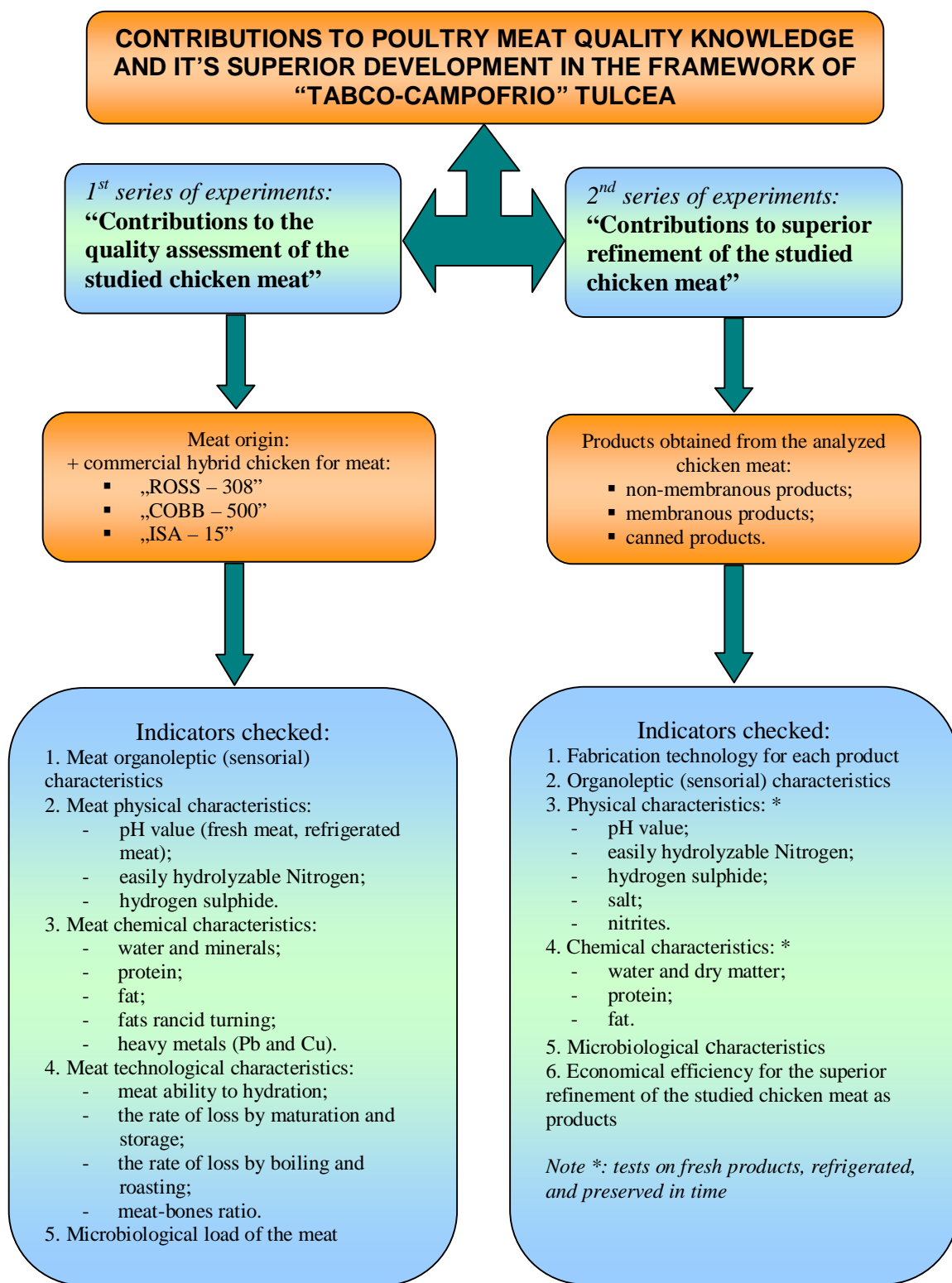
The area in which research has been carried out, North Dobrogea respectively, the problem addressed is very topical, since here is recorded a lesser consumption of chicken meat and products, which we consider as abnormal.

In justifying the present situation we believe that advocates more arguments, among which we can cite:

- limited range of chicken meat products in the grocery stores and high price of the existing ones, not meant to stimulate public interest in their consumption
- lack of meat poultry farms, ensuring a supply of processing units with rhythmic material and to determine the lowest production cost for finished products

To those shown we believe that our research results will lead to an increase in chicken meat processing in the area and will provide incentives for business to invest in poultry.

In *fig. 1.* we are presenting the experimental master schedule followed in the research.



**Fig. 1. Experimental master schedule**

The main indicators checked for *the 1<sup>st</sup> series of experiments*:

- Meat organoleptic indicators: organoleptic (sensorial) characteristics.
- Meat physical indicators:
  - pH value;
  - easily hydrolyzable Nitrogen;
  - Hydrogen sulphide.
- Meat chemical indicators:
  - water and minerals contents;
  - protein content;
  - fat content;
  - fats rancid turning;
  - heavy metals content (Cu and Pb).
- Meat technological indicators:
  - meat ability to hydration;
  - the rate of loss by maturation and storage;
  - the rate of loss by boiling and roasting;
  - the meat-bones ratio.
- Meat microbiological indicators:
  - total number of aerobe mezofile germs (NTGMA).

The main indicators checked for *the 2<sup>nd</sup> series of experiments*:

**A. for the raw material chicken meat**

- Organoleptic indicators:
  - organoleptic (sensorial) characteristics.
- Physical indicators:
  - pH value;
  - easily hydrolyzable Nitrogen;
  - Hydrogen sulphide.
- Chemical indicators:
  - water content;
  - dry matter content;
  - protein content;

- fat content;
- minerals content.
- Microbiological indicators:
  - total number of aerobe mezofile germs (NTGMA).

**B. for the studied chicken meat products:**

- Organoleptic indicators:
  - organoleptic (sensorial) characteristics.
- Physical indicators:
  - pH value;
  - easily hydrolyzed Nitrogen;
  - Hydrogen sulphide;
  - salt content;
  - nitrite content.
- Chemical indicators:
  - water content;
  - protein content;
  - fat content.
- Microbiological indicators:
  - listeria presence;
  - salmonella presence.

## **RESULTS OBTAINED**

### ***A. For the 1<sup>st</sup> series of experiments***

#### ***a) Organoleptic characteristics of the studied chicken meat***

Organoleptic characteristics of the analyzed samples have been normal; no significant changes occurred in the position to deteriorate the quality of meat.

#### ***b) Physical characteristics of the studied chicken meat***

##### ***pH value***

Data from the pH value of the meat (right after slaughter, 12 hours after and 24 hours after slaughter) have been within the range specified by the branch literature.

##### ***Easily hydrolysable Nitrogen content***

Determined values showed high degree of freshness of the analyzed meat.

#### *Hydrogen sulphide content*

Absence of the Hydrogen sulphide in the analyzed meat samples showed that they were originating from fresh meat batches.

#### ***c) Chemical characteristics of the studied chicken meat***

##### *Water and dry matter*

In determining the water and dry matter content the obtained values are close to those indicated by the branch literature consulted, without significant statistical differences noted between meat samples subjected to analysis.

##### *Protein*

Considering the values obtained for protein content (24,15% for “ISA-15” and “ROSS-308” hybrids and 24,22% for “COBB-500” hybrid) and comparing them with values from branch literature we notice that the former are higher than the latter.

##### *Fat*

Determined values for fat parameter, ranging from 2,70% to 2,81% were close to the minimum specified in the branch literature consulted.

##### *Minerals*

Results of the laboratory tests indicated the content of mineral substances were also falling within the normal range.

##### *Fats rancid turning*

In determining the fats rancid turning, Kreis reaction was negative (normal for fresh meat).

##### *Heavy metals*

Following tests for Pb and Cu contents in the meat, very low values have been obtained, bellow the legally permissible.

#### ***d) Technological characteristics of the studied chicken meat***

##### *Meat ability to hydration*

Hydrating percentage of the analyzed meat stood around 5%, without statistical differences found between samples analyzed.

##### *The rate of loss by maturation and storage*

Losses by maturation and storage of the meat for 48 hours were low, ranging between 2,18%-2,21% of initial weight.

##### *The rate of loss by boiling and roasting*

Very close values obtained from both boiling and roasting the meat showed homogeneity between the samples studied.

***e) The bone-meat ratio***

The values of this ratio were  $3,58/1 \pm 0,13$  for “ROSS-308” hybrid,  $3,59/1 \pm 0,21$  for “COBB-500” hybrid and  $3,62/1 \pm 0,18$  for the “ISA-15” hybrid. As one may note, there are very small differences between the studied meat hybrids.

***f) Microbiological load***

Laboratory analysis has shown organic load of the meat analyzed was very small, fitting within the parameters imposed by law.

The multitude of parameters determined in this first series of experiments allowed us to formulate a general conclusion, namely that the raw materials analyzed was able to be processed without restrictions, as it weren't revealed values of meat characteristics (organoleptic, physical, chemical, microbiological etc.) to deviate from the provisions of Standards (STAS) in force. Overall, meat quality was rated very good.

***B. For the 2<sup>nd</sup> series of experiments***

In total, 9 products of chicken meat were studied, with or without protective membrane, or belonging to the “sterilized product” category.

The analysis carried on to asses the quality of the resulting products led us to interesting conclusions. Thus, tasting reports revealed the high degree of acceptance of products and very small differences between fresh products and those at the end of the warranty period. Over time, products pH value grew slowly, but normal.

Laboratory analysis showed that the values obtained for easily hydrolysable Nitrogen content was bellow the maximum imposed by regulations.

All tests performed to determine the Hydrogen sulphide were negative.

Regarding the water content, smaller or larger variations were recorded, depending on the studied product category. As such, for products without protective membrane we have noticed higher water content decrease, due to loss through dehydration. Also in this product category, if the product was vacuum packaged, there were losses due to expression of juice in the bag. Regarding the products with protective membrane, differences related to water content were insignificant, which may be the result of human error.

Regarding the protein content of the finished products, there was a slight concentration towards the end of the warranty period of products, due to loss of water.

With respect to the fat content in meat products, it is known that it is regulated by each product category separately. Our tests did not made exception to this rule.

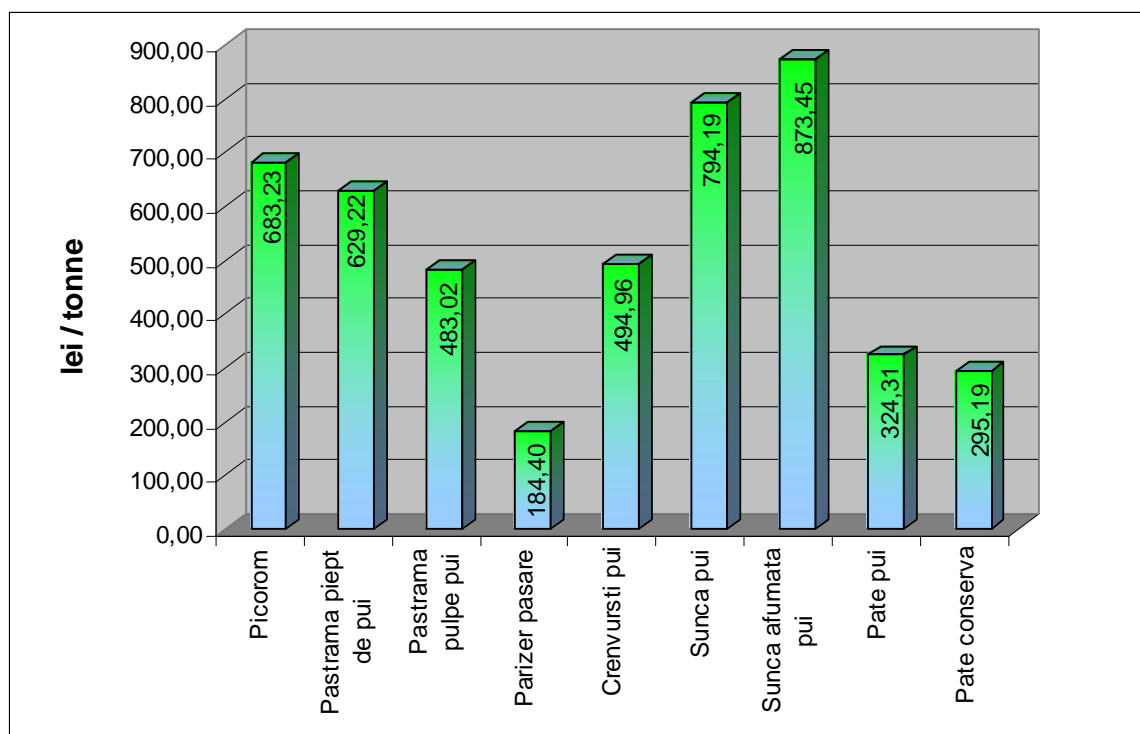


Salt content was kept bellow 3%, maximum admissible by law for this parameter for all studied products.

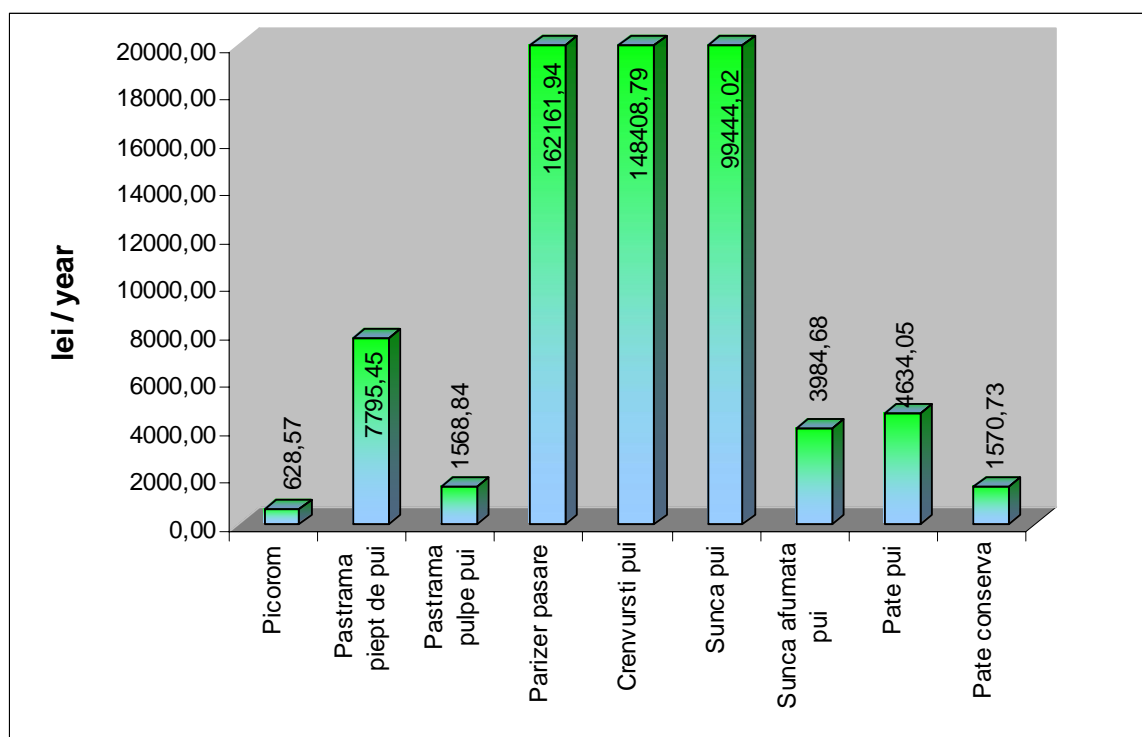
Nitrite content (mg/100g product) in the manufactured products fell as well in the normal range (under 10 mg/100 g product).

Analysis of the microbiological characteristics for the obtained products showed no contamination with *Listeria* and *Salmonella*.

In terms of economic efficiency was found that production and sale of poultry meat products is profitable (*fig. 2*). More revenue was recorded in products manufactured in large quantities (*fig. 3*) due to reduced manufacturing cost achieved by decreasing the downtime resulting from the machinery changeover to produce a product or another; the rest of technological flow was also streamlined, leading to lower final labor cost.



**Fig. 2. Profit per product metric tonne (lei/tonne)**



**Fig. 3. Yearly profit by product (lei/year)**

Of what is shown, clearly separates the fact that in our research a quality raw material was used, which led to obtain finished goods valued by consumers, especially since all technological steps have been followed.

The finished products analysis found a high on protein, while the fat content was in accordance with applicable rules. In regards with microbiology, studied products did not endanger the health of consumers.

In the reported context the products manufactured by us, some with a touch of originality, enjoyed a high degree of appreciation from consumers of all categories.

For the future, based on our research, the company where they were carried out is willing to diversify further the range of chicken meat products, so as to cover growing requirements of consumers. At the same time will expand the range of natural flavors for manufactured products, to meet consumer demands in this regard as well. Also will consider the production of categories well demanded by consumers lately, namely *“preservatives and additives free products”*.

A very good cost structure is essential to launching and maintaining products on the market. It is therefore necessary to analyze very carefully the cost of each individual product, not to show undue costs that will later be reflected in the selling price. Currently, the primary

requirement of the market is as low cost as possible, without affecting their quality, as purchasing power fell dramatically because of economic changes taking place both globally and nationally.

As food production system is a complex chain, large, mistakes are not allowed, since they undoubtedly lead to major incidents. Sequential processing, which includes many manipulations of food or ingredients, increases the possibility of contamination and consequently, improper heat treatment of the food. Development of a close cooperation and strong network between different activity sectors ensures the success of a safe and wholesome food supply.

Food processors, and in “Tabco-Campofrio” as well, tend to manufacture products with extended warranty period, but they must be aware how the composition, processing parameters, packaging system and storage condition influence the development of existing microorganisms in food. Food safety should be included in processing conditions, while developing or reformulating a product. Special care will be taken regarding processing environment, transportation, storage and retail conditions of the food, in order to avoid contamination so as to reach the end user as a safe product.

Implementation and certification of a food safety system based on the principles of HACCP (Hazard Analysis and Critical Control Point), used to identify, assess, control and prevent food safety problems in the production, processing and distribution, bodes well for any unit of the food industry.

An effective program to ensure compliance with legal requirements guarantees the fulfillment by the company of EU legislation, and where appropriate, national legislation and other international standards related to production of food fit for human consumption.

It is desirable to improve horizontal links between producers and processors of raw materials, which ensures obtaining high quality products.

Future opportunities for meat processors are obvious by improving the quality and efficiency of production, investing in modern technology.