

ECONOMIC AND TECHNOLOGICAL ASPECTS OF TENDERNESS OF ADULTS BEEF THROUGH MARINATING

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Abstract: Meat, steaks basic structure provides high biological value protein with essential amino acids in a balanced proportion corresponding to the metabolic needs of the body. Recent research has revealed that marinating meat before grilling leads to a reduction heterocyclic amine content after heat treatment, which is explained by lowering of the temperature and time of roasting or heat treatment methods used. Also, the addition of fruit pulp, garlic and other spices contribute to decreased production of heterocyclic amines due to their antioxidant activity. [Jacob Schor, ND, FABNO, 2010].

The research was aimed the marinated effect on thermal losses of adult beef. To increase the tenderness of beef, we used local spices and seasoning herbs: field thyme (*Thymus vulgaris*), marjoram (*Majorana hortensis*), horseradish (*Armoracia rusticana*), garlic (*Allium sativum*), honey and wine.

It was also pursued on the economic aspect expenses involved in marinating beef, knowing that any superior processing is reflected later in the price of the finished product.

Keywords : marinades, beef tenderness, grilling, economical aspects

Introduction

Due balanced chemical composition (protein, fat, minerals and vitamins) with high biological value, its digestibility, meat is an essential food in human nutrition.

The meat must be fresh, with the following organoleptic characteristics: dry and non-sticky surface, color from pink to red (depending on the species, age, and state of fattening), firm and elastic, fragrant special features.

Main dishes thermal process using dry heat a roasts and basics of menu structure. Whatever form, meat consumption effects a:

- *positive*: stimulation of secretion of digestive juices and growth; contributes to tissue repair worn; due carnitine content decreases LDL and increases HDL cholesterol and reduces vascular resistance strongly reduce arrhythmia;
- *negative*: promoting atherosclerosis, gout, uric lithiasis; promoting an environment favorable for growth of microorganisms (anthrax, tuberculosis, brucellosis) and parasites (*Trichinella spiralis*, *Taenia solium*).

Recently was recommended the tenderness of meat with fruit enzymes from having a high proteolytic activity, for example - pineapple containing appreciable quantities of bromelain, papaya rich in papain.

Although the largest amount of papain found in papaya leaves, are used even pulp where the papain content is lower.

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Materials and methods

The raw material used in the research program, was the leg meat from adult beef (age 5 years). Meat was purchased in refrigerated state, maximum 24 hours postmortem.

Biological material analyzed in the study was represented by: thyme (*Thymus vulgaris*), marjoram (*Majorana hortensis*), garlic (*Allium sativum*), horseradish (*Armoracia rusticana*), honey, lime and dry red wine.

Marinades made in the research program were:

- marinade 1: consists of dry red wine, honey, garlic, pepper and salt;
- marinade 2: consists of dry red wine, honey, garlic, thyme, pepper and salt;
- marinade 3: consists of dry red wine, honey, garlic, marjoram, pepper and salt;
- marinade 4: consists of dry red wine, honey, garlic, horseradish, pepper and salt;
- marinade 5: consists of dry red wine, honey, garlic, thyme, marjoram, horseradish, pepper and salt.

Marinades were kept at room temperature for one hour with intermittent shaking to allow the dry ingredients to hydrate. Control samples were the raw meat without marinating treatment application, but samples was stored under the same conditions as marinades.

Heat treatment consisted of grilling on a hot plate, thermal losses are calculated as the difference between the weight of the sample before and after heat treatment according to the relation (Ionescu, A., Berza, M., Banu, C, 1992):

$$P = [(G_i - G_f)/G_f] \times 100$$

where:

G_i - initial weight of sample, g;

G_f - final weight of sample, g

Results were expressed as percentage.

Results and discussion

Cooked meats underwent significant changes, one of the most important being weight loss due to fat loss juice registered (Shackelford, S.D., et al, 2001; Boleman, S.J., et al, 1997; Koochmaraie, M., 1996; DeYonge-Freeman, K.D., 2000).

The analytical data are listed in Table 1, do to the loss of heat treatment, the type of treatment applied and the duration of sample storage at 4 °C (t_{dep} = 0-14 days).

Table 1. Influence of spices and beef adult marinating on thermal losses

Times of maturat ion (days)	Thermal losses, [%]					
	Control samples	Marinade 1	Marinade 2	Marinade 3	Marinade 4	Marinade 5
0	24,20 ± 0,72	24,20 ± 0,72	24,20 ± 0,72	24,20 ± 0,72	24,20 ± 0,72	24,20 ± 0,72
2	25,24 ± 0,05	23,63 ± 0,28	21,81 ± 0,19	19,67 ± 0,42	20,20 ± 0,25	21,18 ± 0,98
5	21,93 ± 1,13	22,53 ± 0,12	21,02 ± 0,28	19,15 ± 0,49	18,36 ± 0,42	21,07 ± 0,70
8	25,45 ± 0,14	23,46 ± 0,08	18,89 ± 0,31	20,48 ± 0,28	17,85 ± 0,59	18,30 ± 0,62
11	26,22 ± 0,09	19,67 ± 0,28	21,89 ± 0,75	21,84 ± 0,78	21,16 ± 0,56	24,49 ± 0,42
14	27,02 ± 0,14	23,59 ± 0,25	22,28 ± 0,65	24,19 ± 0,34	24,32 ± 0,21	24,49 ± 0,25

Experimental data show an increase in thermal losses both marinated meats and control samples with increasing duration of storage. The evolution of the losses to heat treatment was closely related to developments pH, maintaining it at low decreased water retention capacity with negative implications in thermal losses (Pathania, A., 2010).

Comparing samples of beef marinated with control can be seen that vacuum packaging increases, the thermal losses at the lowest losses were recorded in samples of beef marinated adult. This is because maintaining samples in a mixture of marinating for 48 hours before vacuum packaging, which led to an increase in the amount of bound water and thus to better their juiciness (Molina, M.E., 2005).

Juicy marinated meats increase contributed, particularly, by sodium chloride present in the composition of marinades, that improves water-binding capacity and reduces thermal losses. It increases the ionic strength of the flesh and the extraction of the protein contributes to the formation of networks miofibrilare dimensional retain more water boiling in protein gel matrix (Beef Information Centre, 2002).

Another objective of this work was to verify the effectiveness of the economic process as a means of improving of tenderness of marinating beef.

For this we set all expenses incurred in the purchase of raw materials and auxiliaries. After this calculation was aimed exact amount allocated for marinade for one serving of meat, which then will be found in the price of enzymatic tenderize steak portions.

All expenses incurred by tenderness operation must be found in a certain percentage of the final price of a beef steak in a restaurant menu. For this calculation were considered 8 kg beef equivalent of 40 servings of beef steak which was subject to a marinating, together with 7 l of marinade in tray with capacity of 19 l, existing equipment in catering unit.

Following this operation the amount bet on beef increased by 0.62 kg. Price spices (thyme, marjoram) and garlic flakes was calculated according to the purchase price of the package from the company *Quatre Epices*:

Flakes of garlic - 50 g package, price 5 lei.

Marjoram - Pack 15 g, price 3.5 lei.

Table 2. Costs of one steak

Element	Quantity (kg)	Price (lei/kg)	Value (lei)
Beef meat	8.620	20.00	172.4
Red wine	2.100	6.00	12.6
Honey	0.280	15.00	4.2
Garlik flakes	0.063	100.00	6.3
Pepper	0.014	45.00	0.63
Salt	0.035	1.00	0.035
Thyme	0.028	-	-
Marjoram	0.028	233.33	6.53
horseradish	0.028	12.00	0.336
TOTAL			203.031

If the 8.62 kg of beef marinated costs 203,031lei, than 0.200 kg of beef meat will costs 4.71 lei. Thus, the final price of a beef steak in a restaurant menu, tenderised using this method, present a price increase of 4.71 lei.

Conclusions

The aim of the research was to determine the best option for tenderisation of beef, meat tenderness whose degree is very low compared to other (pork, chicken). Due to the special chemical composition, and low fat content, beef is recommended to be consumed primarily by people suffering from certain health conditions.

Using combinations of spices, herbs, dry red wine and honey lime to obtain tenderness marinades of beef led to increased levels of polyphenols, flavonoids and antioxidant activity with beneficial effects for consumers.

Because marinades, pH marinated samples was maintained at low levels due marinades composition (dry red wine contributes to low pH) and vacuum packaging (one of the reasons being the dissociation of organic acids, lactic and acetic acids, accumulated in muscles tissues), which led, during chilled storage, compaction of protein structure of muscle tissue, reduce water retention, increased accumulated juices inside the package and thermal losses.

Marinating led to gradual decrease of hardness with increasing meat maturation time samples of adult beef marinade and stored in anaerobic conditions. Adult beef tenderness in control samples and samples pickle was generally low, the changes that occurred in the system miofibrillar not sufficiently intense to cause softening of muscle tissue, to give a high meat tenderness, even after 14 days of storage at 40C.

We can say that the research undertaken destination tenderize beef by enzymatic means, is to obtain basic culinary and roasts, regardless of the cooking method chosen.

Tenderize meat by adding enzymes will lead to achieving a high degree of tenderness of roast, which is greatly appreciated by the elderly, children and people who have problems with their teeth.

Therefore, due to treatment of tenderisation of beef, these individuals will not be required to remove such meat menu that brings a very important nutrient intake for proper functioning of the body.

Following this research we can recommend the most reliable variants of tenderisation use by marinating, this method of marinating will improve all sensory characteristics of the sample (taste, smell, color, consistency).

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