

Original Research Article

Research regarding the influence of conservation upon the quality of trout

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A B S T R A C T

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The research led followed the way in which the smoking process influenced the quality of the trout's meat from Valea Putnei trout farm. In the smoking process it was used the smoke produced by fir cones' burning that had been previously very well dried. The fir cones and the smoking technology give to the brook trout a special flavour and colour. The dehydration intensity during the smoking process depends on the water content of trout, on its pieces dimension, on air parameters (relative humidity and temperature) and on the period of smoking. The fat portion of the fish is very important in the formation and perception of the flavour. As in all foods with a high fat content the fish fat can suffer from certain degradations of lipolyze type (enzymatic degradations) or of oxidative type (chemical degradations). From the data obtained during the smoking process we observed a resulting decrease of the fat content from 29% to 17% fact due to the action of temperature and period of smoking. The descendant evolution is due to the phenomena of hot smoking.

Introduction

The brook trout (*Salvelinus fontinalis*), It is originary from USA and it was brought in Europe in 1884 and in Romania in 1906. it is found in a reduced number of streams most of them affluents of the Mureş and Someşul Rece. It has beautiful skin colours. On a greenish-grey background it has small reddish-orange or bright red dots surrounded by a blue colour (Avault Jr., (1996; Beaumont and; Hoare, 2003; Buttelfield Helen, 2000; Davenport et al., 2003) . The pectoral fins and the belly have a white border. The food mainly consists of insects, worms,

crustaceans and smaller fish. The growth is faster than for the indigenous trout due to which it is raised in trout farms. The average weight is between 250 and 500 g. The reproduction takes place in autumn (October-November) the hatching taking place in march (Roszuk and Demska-Zakes, 2005; Fingerman and Nagabhushanam, 2000).

During the preservation process there are several qualitative and quantitative transformations of the notrous substances the realtiv proportions of the main

components continuously being modified (Cowe, 1989).

The wood smoked trout is dried outside and tender inside allowing an easy elimination of the backbone. The smoked trout has a sweet taste coming from the smoke and is not very salty. It is recommended its consumption in the first days after the smoking (Halver, 1982; Leitritz, 1963).

The salting of the trout before the smoking has the following effects:

reducing the speed of bacteria development;
inhibiting the activity of some dangerous microorganisms;
enhancing the taste.

The sodium chloride has an important effect upon the preservation process that has to be appreciated overall taking on account the following reactions of the salt:

reducing the humidity content;
liberating the proteases from the dead cells of the bacteria;
making soluble some proteic fraction that become in this way accessible to some enzymes;
changing the acido-basic equilibrium;
modifying the proportion between the bound and the free water.

Some of the smoke components the phenols have an important effect upon the quality of smoked trout meat especially in the formation of the flavour and colour. The phenols are some of the strongest bactericide substances from smoke even though there is a small amount of phenols in smoke. If the smoking is realised at temperatures higher than 400°C these components can have a harmful effect upon the consumer's health as it is mentioned in the specialized literature (Marinescu, 1974).

A very discussed problem is the presumption that smoke in certain conditions would have a carcinogenic effect due to certain hydrocarbons. From the data existent in the specialized literature we cannot say until now if the smoked products are a real danger for the health or not.

The aromatic polycyclic hydrocarbons (HAP), are a group of chemical substances composed by three or more aromatic rings. Sunt un grup de substanțe chimice compuse din trei sau mai multe inele aromatice. The aromatic polycyclic hydrocarbons are formed during the incomplete combustion processes that appear at different levels of the wood or fuel burning. They can be in this way found in different mixtures in the environment. The foods can be contaminated by environment sources, industrial processing and household processing.

Starting with the month of April 2005, the maximum established level of BaP in UE for meat and smoked products as well as fish and smoked fish is of 5 µg/kg. (CE Directive no 1881/2006). In the case in which the smoking methods used cause higher levels of aromatic polycyclic hydrocarbons there should be investigated alternative methods with the meat manufacturers (George Liviu Mihalca et al., 2011).

The conservation by smoking has the following benefits:

1. ensures a longer shelf life;
2. modifies the sensorial characteristics (appearance, colour, taste, smell, flavour).

The conservation of the smoked trout in wood recipient is of: 72 hours in summer and 14 days when it is preserved at a smaller temperature than 4°C with air contact; it is not recommended to be kept in the fridge or to be refrigerated.

Materials and Methods

The researches led were done with the purpose to establish the influence of smoke upon the meat quality of the fresh trout from Valea Putnei trout farm.

The objectives followed are: sensorial analysis; evolution of water content; evolution of fat content; easily hydrolyzable nitrogen content; evolution of salt content; evolution of acidity; ash content; mineral substances content microbiological analysis of the product after 21 days.

Results and Discussion

In the first step of the experiments led we determined the characteristics of trout in table 1 the determinations were led on the 2 trout samples with the following characteristics: length, temperature, mass, evisceration loses.

Analysis of the data shows a drop in humidity from 60% to 33% in the first day of smoking, explainable by the action of temperature and duration of smoking. In the first seven days is observed decreasing water content from 33% to 28.4%.

Determination of fat content

- for fresh trout

Sample 1: fat substances = 28%

Sample 2:- fat substances = 30%

- for smoked trout

Sample 1: Fat = 18,0%

Sample 2:- Fat substances = 16%

Experimental results of the acidity determinations of the graph are shown in the next figure.8.

There is a small catch fresh acidity. The acidity increases the cobza sea trout with the number of days it is smoked. Growth is due to the intense activity of lactic bacteria until the 21st day, then occurs when lactose is acidity stabilisation made entirely.

Data analysis shows that there has been a slightly decreasing trend of ash content from 0,80% to 0.74% fresh trout from the smoked trout. Ash content decrease occurs as a result of reducing the moisture of the fish smoked.

Energy Dispersive X-ray (EDX) spectrometer is the instrument to perform qualitative and quantitative analyses for elements comprising a material by measuring re-emitted characteristic X-ray from elements. EDX is non-destructive and therefore can be used for various applications like solid, powder, liquid and wafer. Shimadzu EDX series are ready to respond to versatile demands of yours. The samples were spirits, calcinate and studied with EDX.

Sample : trout in cobza

Comment : sample cell 6um mylar

Group : powder_air

Date : 2012.03. 15:50:01

Measurement Condition

Instrument: EDX-900 Atmosphere: Air

Collimator: 10(mm) Spin: Off

Analyte TG kV uA FI Acq.(keV)

Anal.(keV) Time(sec) DT(%)

Na-U Rh 50 1000-Auto ---- 0 - 40 0.00-40.00 Live- 100 5

Quantitative Result

Analyte Result (Std.Dev.) Proc.-Calc.

Line Int.(cps/uA)

====[No. 1 Layer]====< Layer1

6.000 um (-----) Fix

C10H8O4 100.000 % (-----) Fix

====[No. 2 Layer]====< Base

K 66.871 % (0.107) Quan-FP K Ka 4.3071
P 24.668 % (0.206) Quan-FP P Ka 0.2223
Ca 3.997 % (0.063) Quan-FP CaKa 0.1793
S 1.928 % (0.060) Quan-FP S Ka 0.0379
Fe 1.624 % (0.007) Quan-FP FeKa 0.7102
Zn 0.730 % (0.003) Quan-FP ZnKa 0.7248
Cu 0.130 % (0.002) Quan-FP CuKa
0.1096
Rb 0.032 % (0.001) Quan-FP RbKa
0.0639
Br 0.021 % (0.001) Quan-FP BrKa
0.0357

Analysis of polycyclic aromatic hydrocarbons

Smoked fish samples were analyzed for the presence of benzo [a] pirenului (BaP) and other polycyclic aromatic hydrocarbons (PAHs). The method has been used HRGC-MS. this method is in accordance with the criteria for official controls in accordance with Regulation (EC) No 333\2007.

Microbiological control of smoked trout

Smoked fish was parsed from the microbiological point of view, in accordance with the indications of the SR 8-12922. It has been found that from the 14th day, appears on the surface of smoked trout scabs. This phenomenon is caused by the growth of molds. They appear on the surface of the product whereas too wet storage environment was favorable, one with a high humidity. At the same time took place and the phenomenon of perspiration to the finished product.

Microscopic analysis of the optical microscope revealed two types of moulds on the surface of smoked sea trout: Blue moulds (*Penicillium expansum*)-the family Trichocomaceae, figure a) and green moulds (*Penicillium chrysogenum*) the

family Trichocomaceae, figure b).

Microbiological analysis revealed a deterioration of sea trout after the 14th day of smoking, the trout was kept in the air and at a temperature of less than 40 c. One cause of occurrence of moulds can be resistant them to smoke, sometimes mold.

Types of molds which were observed on the surface of sea trout are shown in next figure 11 spores are brought by the materials used to smoking in our case FIR cones.

Conclusions from research performed the following conclusions may be drawn:

smoked trout water drops from 60% to 33% in the first day of smoking; decrease water content continued up to 16.4 percent in the 21st day; This is explained by the action of temperature and duration of smoking; fat content decreased from 29% to 17%, whereas smoking is hot; nitrogen hydrolysable indicates an evolution upward, with an increase of 0.77% in the case of fresh sea trout at trout smoked 0,99%; smoked trout of salt is 2.6%; the fish was kept in his new-salt, made of ¼ (1 part salt and 4 parts water) between 10 and 12 hours; salt process will reduce the rate of multiplication of bacteria will inhibit the activity of micro-organisms, dangerous, and condiment area with thyme will give a better taste; Salt contributes to reduce the moisture content and the issue of protease of bacteria cells death. smoked trout to the acidity increases with the number of days on which it is smoked; growth is due to the intense activity of lactic bacteria until the 21st

Table.1 Fresh trout

Determined trait	U.M.	Sample		Media
		1	2	
Lenght	cm	31	30	30.5
Mass	g	419	406	412.5
Temperature	°C	15	15	15
Edible parts:				
- full trout quantity	g	419	406	412.5
- bowel quantity	g	139	135	137
- edible quantity	g	280	271	275.5
- remained mass	%	66.8	66.7	66.75
Evisceration losses	%	33.2	33.3	33.25

Table.2 Smoked trout

Determination	U.M.	Sample		Media
		1	2	
Lenght	cm	24	23	23.5
Mass	g	129	124	126.5
Temperature	°C	15	15	15
Edible parts:				
- smoked trout quantity	g	275	266	270,5
- removed quantity	g	18	17	17.5
- edible quantity	g	111	107	109
Smoking losses	%	46.9	46.7	46.8



Sample1(P1):

% Water=59.8%

Sample 2(P2):

% Water=60.2%

Fig.1 Fresh trout

Determination of water content of smoked trout



Fig. 2 Smoked trout in the first day

- after the first day of smoked

Sample 1:

% Water = 33.1%

Sample 2:

% Water = 32.9%



Fig. 3 Smoked trout after 7 days

- after 7 days of smoked

Sample 1:

% Water = 28.3%

Sample 2:

% Water = 28.1%



Fig. 4 Smoked trout after 14 days

- after 14 days

Sample 1:

% Water = 21.0%

Sample 2:

% Water = 20.6%



Fig. 5 Smoked trout after 21 days

- after 21 days

Sample 1:

% Water = 16.5 %

Sample 2:

% Water = 16.3 %

Fig. 6 Evolution of the trout water content

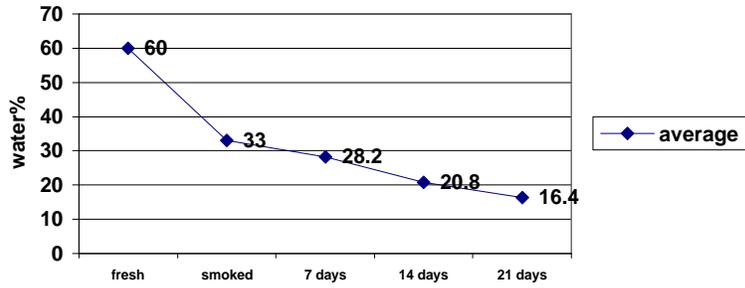


Fig.7 The evolution of the content of easily hidrolisable nitrogen

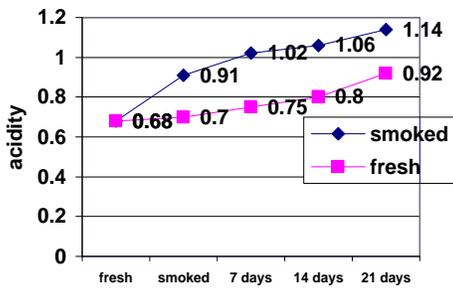
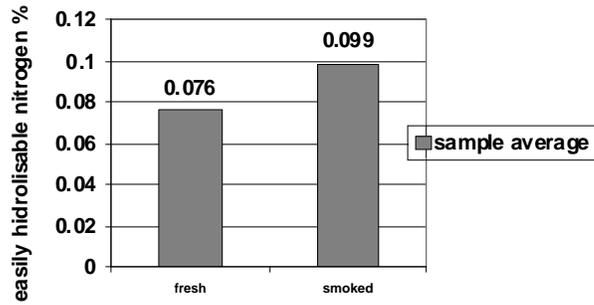


Fig. 8 The evolution of acidity

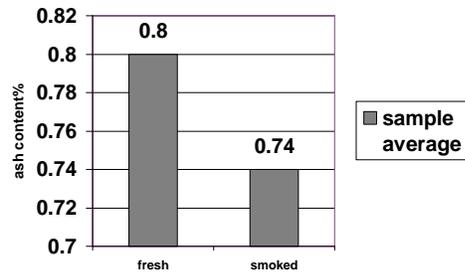


Fig. 9 Evolution of ash content

Fig.10 Analysis of the mineral content of substance using EDX720\800HS



Table.3 Content of BaP in trout smoking at storage

Time of storage (days)	Content of BaP ($\mu\text{g./kg}$)
initial	5.8
7	7.15
14	9.18
21	10.21



Fig. 10 Trout smoked with mold after period of valability

day, then occurs when lactose is acidity stabilization fermented entirely; content ashes falls from fresh trout to 0,80% to 0.74% smoked trout; microbiological control indicates the consumption of sea trout in Cobs within up to 14 days.

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