### CHANGES OF LIPIDS COMPOSITION DURING THE PROCESSING AND STORAGE OF "UZICE BEEF PRSHUTA" - TRADITIONAL DRY MEAT PRODUCT

#### RADOVANOVIC R., BOJOVIC P. and BASTIC M.\*

Faculty of Agriculture - Yu, Belgrade. \* Faculty of Technology and Metalurgy - Yu, Belgrade.

S-VIA.10

#### SUMMARY

In this study the lipids composition in two different parts of meat, obtained from round and loin ("sol" and "rozbratna"), is analysed during the processing and storage of "UZICE BEEF PRSHUTA".

During the producing and storage of "UZICE BEEF PRSHUTA" the composition of lipids changes. First of all it can be noticed by an increase in the total saturated fatty acids content (from 47.589% and 47.763% in "sol" and "rozbratna" before salting, to 57.495% and 60.972% in "sol" and "rozbratna after 30 days of storage), as well as by a decrease in the total unsaturated fatty acids content (45.113% and 42.522% - "sol" and "rozbratna" before salting; 32.859% and 32.856% - "sol" and "rozbratna" after 30 days of storage).

#### INTRODUCTION

"UZICE BEEF PRSHUTA" is one of the shelf stable dry meat products traditionally processed in the area of montain Zlatibor, southwestern Serbia, during the winter months (November -Februry). Due to it's convenient nutritions and sensory charac-teristics, this product is appreciated and very popular on the market. The main characteristics of processing and the stable dry meat product is appreciated and very popular on the market.

The main characteristics of processing procedure, as well as the major chemical and physico-chemical quality factors of "UZICE BEEF PRSHUTA", obtained from two different parts of meat ("sol" - *m. gracilis* with part of *m. semimembranosus*; "rozbratna" - cranial part of *m. longisimus thoracis*), are presented in detail in our previous papers (Radovanovic et al., 1993, 1990/a and 1990/b).

After 7 days of salting  $(t_{max} = 5^{\circ}C)$  and 21 days of drying and smoking  $(t_{max} = 12^{\circ}C)$  "UZICE BEEF PRSHUTA", obtained from carefully shaped muscle groups, contains in average 40% of water and 4-5% of NaCl. In the final product pH value drops to 5.4 and Aw value is 0.8. In the same time, prshuta obtained from "sol" contains higher quantity of proteins (47%) and lower amount of lipids (5%), compared to the product from "rozbratna" which is composed of 38% of proteins and 16% of lipids.

Besides the above mentioned quality factors, nutritive and sensory characteristics of meat and meat product, including the "UZICE BEEF PRSHUTA", depend a great deal on the composition of their lipids. (Vukovic, 1992; Dryden et al., 1970). It is determined by the content of major lipids fractions (neutral lipids, phospholipids and glucolipids), as well as by the fatty acids composition.

It is well known that qualitative characteristisc of the lipids, above all, depend on type, race, age, breeding conditions and sex of animals which are used for meat production (Karan -Djurdjic., 1980; Link et al., 1970).

In addition, the lipids composition is influenced by quantity of fat which is incorporated in the muscle tissue. Meat with higher quantity of fat is richer in extracelular lipids and contains more neutral lipids and saturated fatty acids, in comparison with the lean meat wich has lower value of the extracelular/intracelular lipids ratio. In the same time, the contents of phospholipids, glucolipids and unsaturated fatty acids in the lipids isolated from lean meat are higher, compared to the meat with greater amount of fat. As an illustration, the data published by Bastic et al. (1989) can be used. Lipids of lean beef meat (2.92% of total lipids) are composed of 75.10% of neutral lipids, 22.82% of phospholipids and 2.08% of glucolipids. As opposed to that, the fat usual lipids contain higher quantity of neutral lipids (95.56%) and lower quantities of phospholipids (3.03%) and glucolipids (0.41%).

Finally, the composition of lipids, also, depends on the processing conditions (Bechtel, 1986). Usage of unequal processes and producing conditions, as well as adding of different additives, spices and microbiological starters, improve the variations of lipids composition. This is particularly obvious during the

shelf stable dry meat products processing, wich lasts longer and improves significant changes of lipids composition.

In view of the data obtained from the accesible literature it can be observed that qualitative characteristics of the lipids from "UZICE BEEF PRSHUTA" are still not determined. In accordance with that fact, we have decided to include in this paper the defining of lipids composition during the processing and storage of "UZICE BEEF PRSHUTA".

MATERIALS AND METHODS: This study is conducted during the processing and storage of "UZICE BEEF PRSHUTA", which are realised according to the traditional technology (Radovanovic et al., 1990/a).

Two different parts of meat obtained from beef round and loin, which have previously been stored in a fozen state for less than three months, are analysed: "sol" - *m. gracilis* with part of *m. semimembranosus*; "rozbratna" - cranial part of m. longisimus thoracis.

Lipids are isolated from "sol" and "rozbratna" in five different phases of processing and storage:

- phase 1 - immediately before salting;

- phase 2 - the last (7th) day of salting;

- phase 3 - the last (21st) day of drying and smoking;

- phase 4 15th day of storage;
- phase 5 30th day of storage.

Extraction of total lipids from "UZICE BEEF PRSHUTA" is done according to Folch et al. (1957), at 15°C.

Separation of total lipids and neutral lipids is realised according to the procedure described by Johnston et al. (1983). After the evaporation of solvent in a nitrogen gas stream, the mass contents of fractions are determined gravimetrically and expressed as a percentage of total and neutral lipids.

Finally, determination of fatty acids composition is conducted according to Bastic et al. (1989).

# RESULTS AND DISCUSSION

The composition of lipids from "sol" and "rozbratna" isolated during the processing (phases 1, 2 and <sup>3)</sup> and storage (phases 4 and 5) is presented in TABLE 1. It can be noticed that, within the observed phases, total line in the second storage (phases 4 and 5) is presented in TABLE 1. It can be noticed that, within the observed phases, total line in the second secon total lipids extracted from "sol" are, in average, composed of 82.08-83.92% of neutral lipids, 14.70-16.76% of phosphetic phospholipids and 1.16-1.81% of glucolipids. Within the fractions of neutral lipids, the quantity of triglycerides is mucher higher (85.46-88.70%), compared to diglycerides (3.59-5.59), monoglycerides (2.01-3.71%) and 3.71%), free fatty acids (1.32-3.31%), cholesterol (1.50-2.48%), cholesterol esters (1.59-2.31%) and hydrogen hydrocarbons (0.44-0.89%).

In accordance with lipids of "sol", total lipids of "rozbratna" contain more neutral lipids (87.16-<sup>88,61%</sup>), less phospholipids (10.10-11.38%) and almost equal amount of glucolipids (1.23-1.55%). In additional different prophetical from "rozbratna" is higher (3.57-4.78%) and addition, the concentration of cholesterol in the neutral lipids from "rozbratna" is higher (3.57-4.78%) and the content of <sup>content</sup> of digly-cerides lower (2.28-3.00%). Finally, as for the presence of other fractions, the content of neutral lipids in "sol" and theamounts are as follow neutral lipids in "rozbratna" equals the composition of neutral lipids in "sol", and theamounts are as follows: 85,43, 97, 156, 2, 159% free fatty acids: 1,42-2,16% -85.43-87.10% - triglycerides; 2.07-3.01% monoglycerides; 1.55-3.15% - free fatty acids; 1.42-2.16% cholesterol esters; 0.39-0.91% - hydrocarbons.

On the basis of values shown in TABLE 1 it can, also, be observed that the content of total lipids slightly changes during the processing and of "UZICE BEEF PRSHUTA" (phases 1, 2 and 3). In comparasion with the with the composition of total lipids which were isolated from "sol" prior to salting - phase 1 (82.08% of neutral lipids 16 7 m "rozbratna" (87.16% of lipids, 16.76% of phospholipids and 1.16% of glucolipids), and those isolated from "rozbratna" (87.16% of neutral lipids in the final product (phase 3) neutral lipids, 11.38% of phospholipids and 1.46% of glucolipids), and those isolated from reduct (phase 3) contain a start 1.38% of phospholipids and 1.46% of glucolipids), total lipids in the final product (phase 3) and less <sup>contain</sup> a slightly larger amount of neutral lipids (83.20% - "sol" and 87.49% - "rozbratna") and less phospholipids (15.29% - "sol" and 11.13% - "rozbratna"). In the final phase of the production the content of glucolinid. glucolipids in total lipids isolated from "sol" is larger (1.51%), and lesser in "rozbratna" (1.38%), compared with the rewith the raw samples (phase 1).

During the storage period (phases 4 and 5) the composition of total lipids from "UZICE BEEF

PRSHUTA" is fairly stable and no regularities in varying of the achived results have been established. However, during the processing and storage of "UZICE BEEF PRSHUTA" some regular trends of Value changes have been noted, wich are related to the composition of neutral lipids. During all the observed phases of production and storage, the contents of diglycerides, monoglycerides and free fatty acids rise gradually of the contents of diglycerides are related only for certain contents of diglycerides gradually. Some exceptions to this general rule can be observed only for certain contents of diglycerids and monophysics in the drying and smoking of "sol" (3.8) monoglycerides. That is to say, the content of diglycerides drops during the drying and smoking of "sol" (3.84%

- phase 2; 3.80% -phase 3), and during the salting (2.40% - phase 1; 2.28% - phase 2) and the storge of "rozbratna" (2.90% - phase 3; 2.54% - phase 4). The amount of monoglycerides in neutral lipids decreases in the period between 15th and 30th day of storage of "sol" (3.71% - phase 4; 3.09% - phase 5), and during the salting of rozbratna (2.09% - phase 1; 2.07% - phase 2).

In contrast with this, constant trend of decreasing content in neutral lipids can be noted within fractions of triglycerides and hydrocarbons. In this case, some exceptions from the shown regularity exist only during the first 15 days of storage, when the amount of hydrocarbons in neutral lipids of "rozbratna" increases from 0.55% (phase 3) to 0.60% (phase 4).

Generally speaking, during the processing and storage of "UZICE BEEF PRSHUTA" the concentration of cholesterol decreases, for 20.00% in "sol" and 16.28% in "rozbratna". Still, no regularities have been established within the cholesterol amount variations in the observed phases.

TABLE 2 shows the data on fatty acids content of lipids isolated from "sol" and "rozbratna" during the production process (phases 1, 2 and 3) and storage (phases 4 and 5). On the basis of these values, we can observe that the amount of saturated fatty acids ("SFA") in total fatty acids of "sol" varies within the range of 45.589% to 57.495%. The average content of monounsaturated fatty acids ("MUFA") is 30.883-41.125%, and the concentration of polyunsaturated fatty acids ("PUFA") is notably lower and ranges between 1.976% and 3.988%).

In comparasion with these values, for the lipids of "rozbratna" within all the observed phases we have noted higher content of "SFA" (47.763-60.972%), lower content of "MUFA" (30.852-38.555%), while the concentration of "PUFA" is nearly the same (2.004-3.967%). The only exception is displayed after 15 days of of storage (phase 4), considering that the content of "MUFA" in lipids of "rozbratna" (31.463%) is higher than the content of "MUFA" in the lipids from "sol".

Generally speaking, changes in the fatty acids content of lipids during the processing and storage of "UZICE BEEF PRSHUTA" have a regular course. In the lipids of both muscles groups the rise in concentration of "SFA" is evident, while the contents of "MUFA" and "PUFA" lower. Compared to prshutas prior to salting (phase 1), the content of "SFA" in lipids isolated after 30 days of storage (phase 5) increases for 26.12% in "sol" and 27.66% in "rozbratna". In the same interval of time, the concentration of "MUFA" decreases for 24.90% ("sol") and 19.98% ("rozbratna"), and the decrease in "PUFA" is as high as 50.45% ("sol") and 49.48% ("rozbratna").

**CONCLUSIONS**: On the basis of the results of the research wich was done on the lipids isolated from "UZICE BEEF PRSHUTA" during it<sup>\*</sup> processing and storage, the following conclusions should be emphasized:

- Within the observed phases, the total lipids are composed of 82.08-83.92% of neutral lipids, 14.70-16.76 % of phospholipids and 1.16-1.81% of glucolipids ("sol"), and 87.16-88.61% of neutral lipids, 10.10-11.38% of phospholipids and 1.23-1.55% of glucolipids ("rozbratna").

- The content of triglycerides in neutral lipids decreases from 88.70% (phase 1) to 85.46% (phase 5) - "sol", and from 87.10% (phase 1) to 85.43% (phase 5) - "rozbratna".

- The quantity of free fatty acids in neutral lipids increases from 1.32% (phase 1) to 3.31% (phase 5) - "sol", and from 1.55% (phase 1) to 3.15% (phase 5) - "rozbratna".

- The neutral lipids isolated from "rozbratna" contain more than twice as big a quantity of cholesterol, compared to "sol". In addition, during the observed phases the concentration of cholesterol drops from 1.90% to 1.52% ("sol") and from 4.30% to 3.60% ("rozbratna").

- The content of saturated fatty acids rises from 45.589% (phase 1) to 57.495% (phase 5) - "sol", and from 47.763% (phase 1) to 60.972 (phase 5) - "rozbratna". As opposed to that, the concentration of monounsaturated and polyunsaturated fatty acids drops within all the observed phases.

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