



UNIVERZITET U
Kragujevcu
AGRONOMSKI FAKULTET U
ČAČKU



UNIVERSITY OF
Kragujevac
FACULTY OF
AGRONOMY
ČAČAK

XX SAVETOVANJE O BIOTEHNOLOGIJI

sa međunarodnim učešćem

- ZBORNİK RADOVA -



Čačak, 13.- 14. Mart 2015. godine

| | |
|---|-----|
| <i>Vera Đekić, Jelena Milivojević, Jelić Miodrag, Vera Popović, Snežana Branković, Vesna Darko Andronikov, Aco Kuzelov, NakoTaskov, Dusica Saneva, Aco Janevski, Kiro Mojsov, Elenica Softjanova: THE INFLUENCE OF THE CONTENT OF THE BRINE ON THE GROWTH RATE AND THE LOSS OF WEIGHT OF SOME SMOKED PORK PRODUCTS.....</i> | 269 |
| <i>Vladimir Tomović, Marija Jokanović, Snežana Škaljac, Branislav Šojić, Tatjana Tasić, Predrag Ikonić, Dušan Živković, Slaviša Stajić, Biljana Pajin, Ivana Lončarević: HEMIJSKI SASTAV M. semimembranosus I M. longissimus thoracis et lumborum SVINJA PET ČISTIHA RASA ODGAJANIH U VOJVODINI.....</i> | 275 |
| <i>Vladimir Tomović, Marija Jokanović, Branislav Šojić, Snežana Škaljac, Tatjana Tasić, Predrag Ikonić, Dušan Živković, Slaviša Stajić, Biljana Pajin, Ivana Lončarević: HEMIJSKI SASTAV JETRI I BUBREGA SVINJA PET ČISTIHA RASA ODGAJANIH U VOJVODINI.....</i> | 281 |
| <i>Vladimir Kurčubić, Pavle Mašković, Natalija Džinić, Slavica Vesković-Moračanin: UTICAJ FUNKCIONALNE SMEŠE NA BAZI ALGINATA NA HEMIJSKI KVALITET I ENERGIJSKU VREDNOST VIRŠLI.....</i> | 289 |
| <i>Valentina Semenčenko, Milica Radosavljević, Dušanka Terzić, Marija Milašinović-Šeremešić: MOGUĆNOSTI PRIMENE ZRNA HIBRIDA KUKURUZA U PROIZVODNJI HRANE ZA LJUDE I ŽIVOTINJE.....</i> | 297 |
| <i>Slavica Veskovic Moračanin, Milan Milijašević, Dragutin Đukić, Vladimir Kurčubić, Pavle Mašković, Leka Mandić: PRIMENA PRIRODNIH ANTIMIKROBNIH JEDINJENJA U BIOLOŠKOJ ZAŠTITI HRANE.....</i> | 303 |
| <i>Jelena Pantović, Gordana Vićentijević Marković, Miomir Nikšić, Ninoslav Nikićević: LEKOVITA SVOJSTVA MEDA SA DODATKOM GLJIVE <i>Coriolus versicolor</i>.....</i> | 309 |
| <i>Hanadija Omanović, Alma Mičijević, Amna Bijedić: TEHNOLOŠKA KVALITETA BISTROG SOKA OD JABUKE NA TRŽIŠTU GRADA MOSTARA (TEHNOLOŠKI KVALITET).....</i> | 315 |
| <i>Dragana Radojičić, Mirjana Radovanović, Goran Marković: BROMATOLOŠKE ANALIZE STUDENTSKIH OBROKA U STUDENTSKOM CENTRU ČAČAK.....</i> | 321 |
| <i>Snežana Stevanović, Tanja Petrović, Aleksandar Leposavić, Franc Kosi, Dragan Marković, Vojislav Simonović: PROMENA KVALITETA I ANTIOKSIDATIVNE AKTIVNOSTI JAGODE NAKON ZAMRZAVANJA.....</i> | 327 |
| <i>Marijana Ačanski, Kristian Pastor, Đorđe Psodorov, Snežana Kravić, Radojka Razmovski, Đura Vujić: ODREĐIVANJE SADRŽAJA HELJDE U HLEBU ANALIZOM METIL ESTARA DOMINANTNIH MASNIH KISELINA.....</i> | 335 |
| <i>Blaga Radovanović, Ana Milenković-Andjelković, Aleksandra Radovanović, Marko Andjelković: HPLC ANALYSIS OF PHENOLIC COMPOUNDS AND ANTIOXIDANT ACTIVITY OF RIBES FRUIT LEAVES.....</i> | 341 |
| <i>Blaga Radovanović, Marko Andjelković, Vladimir Radovanović, Ana Milenković-Andjelković, Snežana Đekić: POLYPHENOLS AND ANTIOXIDANT ACTIVITY OF DIFFERENT VINEGRAPE LEAVES.....</i> | 347 |
| <i>Sanja Matić, Snežana Stanić, Milan Mladenović, Nevena Stanković: GENOTOKSIČNI EFEKAT METANOLSKOG EKSTRAKTA BILJKE COTINUS COGGYGRIA SCOP. KOD DROSOPHILA MELANOGASTER.....</i> | 353 |
| <i>Zoran Marković, Zorica Petrović, Dušica Simijonović, Vladimir Petrović, Jelena Đorović: ANTIOXIDANT ACTIVITY OF SOME SCHIFF BASES: EXPERIMENTAL AND THEORETICAL STUDY.....</i> | 359 |
| <i>Zoran Marković, Svetlana Jeremić, Dejan Milenković, Jelena Đorović: MECHANISMS OF ATIOXIDATIVE REACTIONS OF ALIZARIN WITH FREE RADICALS.....</i> | 367 |

THE INFLUENCE OF THE CONTENT OF THE BRINE ON THE GROWTH RATE AND THE LOSS OF WEIGHT OF SOME SMOKED PORK PRODUCTS

Darko Andronikov¹, Aco Kuzelov², NakoTaskov³, Dusica Saneva³, Aco Janevski¹, Kiro Mojsov¹, Elenica Sofijanov⁴

Corresponding author: darko.andronikov@ugd.edu.mk; tel: +389 32 550 111

Original scientific paper

Abstract: The aim of our study was to determine the influence of the content of the brine on the the growth rate and the loss of weight of some pork products: neck, shoulder, boneless and fresh bacon (green bacon - pancetta). Used were: 3 pieces of neck, 3 pieces of shoulder, 3 pieces of boneless and 3 pieces of bacon (pangea/pancetta). All pieces were measured separately before and after injection, and after heat treatment. At the same time was made and microbiological analysis of the total number of bacteria (*Bacillus*) in all four categories of meat, taken at random before and after injection, and after heat treatment. The largest growth after injecting was determined in the boneless pork (20.8%) and lowest in pancetta (6.46%). The lowest weight loss after heat treatment was observed in pancetta (0.77%) while the largest weight loss in a pork neck (8%). The total number of bacteria (*Bacillus*) before injection is highest in pancetta (3.85 log CFU/g), while after heat treatment is lowest in pork neck (1.08 log CFU/g).

Keywords: grow rate and loss of weight, smoked pork products, the total number of bacteria

Introduction

How would use the technical possibilities of preservation of meat, such as: physical assets (refrigeration and freezing), chemicals (salt, nitrate and nitrite) and thermal resources (pretensions, boiling and smoking) for produce the different semi dry smoked products (sausages, neck, shoulder, boneless, bacon). Sustainability of the mentioned products is increasing, but it is different and depends on the type of product. In fresh sausage sustainability is the shortest, longer is in semi dry meat products, and is the longest in dry meat products (even up to 1 year). Among the various methods of conservations of meat, salting and brining is one of the oldest. Curing of the meat comprises: adding salt and various additives (nitrate, nitrite, phosphate, sugars - glucose, ascorbic acid, etc.) and spices dissolved in water. There is a wet and dry curing meat (Beganovic, 1975; Bem and Adamic, 1991; Belicoski et al., 1997; Barat et al., 2002; Bacus, 2006; Peric and Đorđević, 2007).

¹ Faculty of Technology, University Goce Delcev Stip, Krste Misirkov bb, Stip, R. Macedonia

² Faculty of Agriculture, University Goce Delcev Stip, Krste Misirkov bb, Stip, R. Macedonia

³ Faculty of Tourism and Business Logistics, University Goce Delcev Stip, Krste Misirkov bb, Stip, R. Macedonia

⁴ Faculty of Economics, University Goce Delcev Stip, Krste Misirkov bb, Stip, R. Macedonia

Wet curing is done in several ways: by dipping the meat in a solution of a curing compound or following the injection brine into the meat. Today brine meat is injected with a very injection or needle or pickle injector where brine is injected into the meat quickly and evenly. As a result of brining in meat has increased sustainability while improving its sensory properties and above all the smell, taste, color and turgidity. In the production of semi dry products are used all the mentioned funds, in order to reduce the number of unwanted bacteria while meat and meat products would increase durability. But every technical processing of meat has its drawbacks, and the meat loses some of its nutrients and loses its weight by evaporation - drying (loss of weight).

The aim of our study was to examine the impact of the content of the brine and the growth rate of loss weight, and determining the total number of bacteria in some pork products before and after injection, and after heat treatment.

Material and methods

As test material was taken fresh boneless pork meat and fresh bacon of the pigs breed Dalant. Pigs are slaughtered and processed after reaching the live weight of about 110 - 120 kg. After slaughter, primary processing and cooling of pig halves on the temperature of 4 °C for 24 hours was performed classification and categorization of pig halves of main parts and categories. The 3 pieces of neck, 3 pieces of shoulder, 3 pieces of boneless and 3 pieces of bacon (pangea/pancetta) are measured on electronic weigh (each piece separately) where was determined their weight before brining. After brining was performed measurement again in order to determine the mass of the pieces after the meat brining. The brine recipe that brined slices of meat with the needle injection - pickle injector is composed of: salt, nitrite, smoke, malkovita (stabilizer for consistency of meat E 451, E 452, sugars, glucose, antioxidant E 301, E 316, flavorings E 621, flavors, salt and spices extracts, REGIS SA, Bd Pérolles 34, 1705 Fribourg, Switzerland) and water. Brining machine (Pickle Injector) is made by conveyor, brine reservoir, injection needle brine and electromotor. Prepared brine tank is placed in the machine. Meat ready for brine is weighed and placed to the transport machine. The speed of movement of the transport bar that meat is transferred is sync with the sting of needles, so that when the meat will come under the needles they enter the meat and brine injected into it. Depending on the number of needles and their mutual distance, the meat is injected with planned amount of brine in several places. Pork neck and shoulder injected 50 - 60%, pork boneless injected 35 - 45%, pork bacon (pancetta) injected 25 - 35%.

The thermal treatment of neck, shoulder, boneless pork and pancetta is performed at following recipe: 15 min. drying on temperature in the smoking chamber (Tk) 60 °C, 45 min. smoking with hot smoke on Tk 65 °C, 45 min. smoking with thick smoke on Tk 70 °C, 120 min. baking with smoking Tk 85 °C, temperature in the center of the product (T_{cp} 72 °C).

Microbiological analysis

Following bacteria were determined: Total bacteria (*Bacillus*) number - ISO 4833/2003. Sown on nutrient agar to 37 °C during 24 hours. Data were transformed into log₁₀ CFU/g before comparison of means. The results were statistically processed using mathematical program Microsoft EXEL ANOVA (single factor) 2009 / 2013.

Results and discussion

The results of the performed tests are given in Table 1 and 2. From Table 1, it is seen that the lowest average weight before brining has boneless pork pieces (0.422 g) and the highest average mass has pork neck pieces 1.080 kg. The lowest average mass per injection has boneless pork (0.528 g) and the largest pork neck 1.220 kg. The lowest average mass after heat treatment has boneless pork (0.418 kg) and the largest pork neck (0.988 kg). The largest growth after injecting was determined in the boneless pork (20.8%) and lowest in pancetta (6.46%). The lowest weight loss after heat treatment was observed in panceta (0.77%) while the largest weight loss in a pork neck (8%). In pork shoulder is not determined mass loss but a small insignificant increase is likely due to better reception of the brine in the meat of the shoulder.

Table 1. Average weight of pieces of meat before injection, after injection and after heat treatment

Tabela 1. Prosečna težina komada mesa pre injektovanja, nakon injektovanja i posle toplote obrade

| Product name | Number of pieces | Average weight before injection X ± Sd | Average weight after injection X ± Sd | Average weight after heat treatment X ± Sd |
|----------------------|------------------|---|--|---|
| Pork neck | 3 | 1.080±0.58 | 1.220±0.88 | 0.988±0.40 |
| Pork shoulder | 3 | 0.580±0.18 | 0.628±0.12 | 0.582±0.22 |
| Pork boneless | 3 | 0.422 ±0.15 | 0.528±0.82 | 0.418±0.25 |
| Pork bacon (panceta) | 3 | 0.522±0.10 | 0.558±0.28 | 0.518±0.42 |

Microbiological analysis

The results of microbiological analysis of pieces of meat are shown Table 2. The lowest microbial contamination before brining in terms of total number of bacteria (*Bacillus*) in a pork neck (2.80 log CFU/g) and has the largest microbiological contamination in pancetta (3.85 log CFU/g). Same is the case after injected. After heat treatment of all tested products microbiological analysis showed a reduction of the total number of bacteria (*Bacillus*), the lowest values determined in pork neck (1.08 log CFU/g), while the largest values determined in pork bacon - pancetta (1.22 log CFU/g).

Table 2. Microbiological picture of pieces of meat before injection, after injection and after heat treatment

Tabela 2. Mikrobiološka slika komada mesa pre injektovanja, nakon injektovanja i posle toplotne obrade

| Product name | Before injection | After injection | After heat treatment |
|-----------------------|------------------|-----------------|----------------------|
| Pork neck | 2.80 log CFU/g | 2.98 log CFU/g | 1.08 log CFU/g |
| Pork shoulder | 3.28 log CFU/g | 3.42 log CFU/g | 1.10 log CFU/g |
| Pork boneless | 3.52 log CFU/g | 3.78 log CFU/g | 1.18 log CFU/g |
| Pork bacon (pancetta) | 3.85 log CFU/g | 4.20 log CFU/g | 1.22 log CFU/g |

Conclusion

The obtained results show that the lowest average weight before the injection had a pork boneless and the greatest pork neck. The same situation exists after the injection and after heat treatment. The highest total number of bacteria (*Bacillus*) was in a pork bacon and lowest in a pork neck. After injection in all the pieces of pork meat total number of bacteria was slightly increased after heat treatment smallest total number of bacteria was at the pork neck and highest in pork bacon. From this we can conclude that the hygienic conditions in which the course of this experiment were impeccable.

References

- Bacus, J.N. (2006): Natural ingredients for cured and smoked meats. Proceedings of the 59th Annual American Meat Science Association Reciprocal Meat Conference, 77-78.
- Barat J.M., Rodrigez-Barona, S., Andres, A., Fito, P. (2002). Influence of increasing brine concentration in the cod salting process. Journal of Food Science, 65 (7), 1922-1925.
- Beganović, A.H. (1975). Mikrobiologija mesa i mesnih preradjevina. Univerzitet u Sarajevu, 14 - 19.
- Belicoski S., Kuzelov A., Pejkovski Z., Stojanovski M. (1997). Effect of tumbling upon yield of smoked pork. Macedonian agricultural review, 44, 2, 75-79.
- Bem, Z., Adamič, J. (1991). Mikrobiologija mesa i proizvoda od mesa. Tehnološki fakultet Novi sad, 91-102.
- Perić, T., Đorđević, T.S. (2007). Proizvodnja kobasica i suhomesnatih proizvoda. Poljo Knjiga, Beograd, 54 -75.
- Total Bacteria (*Bacillus*) Number, Official Method ISO 4833, 2003.