THE EFFECT OF ADDING FISH MEAT (*CLARIAS GARIEPINUS*) ON THE QUALITY PARAMETERS OF THE MEAT PRODUCT

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Introduction

Meat is a significant part of the human diet, especially in Czech republic, which is due to the content of high-quality proteins, vitamins, and minerals. However, the quality of meat is determined by many factors that together form its quality for technological use. Meat products such as sausages, salami, ham, pâtés, and others could be also a a good source of protein, but mosty cloud be meat products contain higher amounts of salt and fat. These fats are mainly composed of saturated fatty acids and monounsaturated fatty acids.

The main proportion of polyunsaturated fatty acids in meat products is the n-6 group. These have a rather undesirable and could have an inflammatory effect on the human body (Gutierres, Pacheco, Reis, 2025). More important for the human body is the content of n-3 polyunsaturated fatty acids, especially eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). These have anti-inflammatory effects (Lands, 2005) and a preventive effect against the development of cardiovascular diseases (Rozíková et al., 2013). However, their accumulation in the body depends on direct intake from the diet. It is generally recommended to consume at least 500 mg PUFAn-3 per day as a prevention against chronic diseases (Lamaziere et al., 2013).

However, worldwide, the intake of EPA and DHA is below of the recommended limit in 76% of cases (Calder e tal., 2025). This indicates that the population consumes a lack of fish and fish products, which are the main source of these fatty acids. Although its consumption is high in some European countries, Central European countries, including the Czech Republic, show significantly lower consumption compared to the European Union average (Shivarov, 2023).

Due to the low proportion of n-3 polyunsaturated fatty acids in the human diet, the current interest in healthier foods and the specific technological properties of fish meat, there is an opportunity to process a meat product with fish meat to increase the content of EPA and DHA fatty acids.

Material and methods

African sharptooth catfish (*Clarias gariepinus*) bred at MENDELU in a recirculation system. Slaughtering and processing of fish fillets was conducted in the MENDELU pilot meat production plant (cutter, filler, smoker) using Fish Sausage recipe CZ22067-123 (Tab.1). Quality parametres od sausages were determined as total determination of fat and faty acid profile by gas chromatography (GC Master; Dani, Italy with capillary colon Lion Column LN-FAME 30 m × 0,25 mm × 0,25 µm) according to Komprda et al. (2015). Another quality parametres was deteremination of colour according to spectrofotometry analysis (CIELAB) by spetrophotometr CM-3500d (Konica Minolta, Japan). The sensory analysis of all 7 types of sausages were provided in the sensory laboratory of the Department of Food Technology by trained evaluators (n = 20), graphic unstructured scale 100 mm in length was used for evaluation to eleven descriptors where 8 of them were intensity descriptors and 3 were hedonic descriptors. Statistical evaluation were provided in STATISTICA 14 software, basic statistical characteristics were calculated for the obtained values and one-way analysis of variance was performed, including the evaluation of contrasts using Tukey's HSD test at a significance level of $P < 0.05$.

Tab 1: Types of sausages (groups of samples)

	Description
RK0	Sausages with 0% addition of fish meat, control sample
RK40	Sausages with 40% addition of fish meat
RK100	Sausages with 100% addition of fish meat
RK24H	Sausages with 100% addition of fish meat with maturity 24 hours
RK72H	Sausages with 100% addition of fish meat with maturity 72 hours
RKS	Sausages with 100% addition of fish meat with age/size of 13-15 months and 2000-2200 g
RKM	Sausages with 100% addition of fish meat with age/size of 6-8 months and 800-1000g

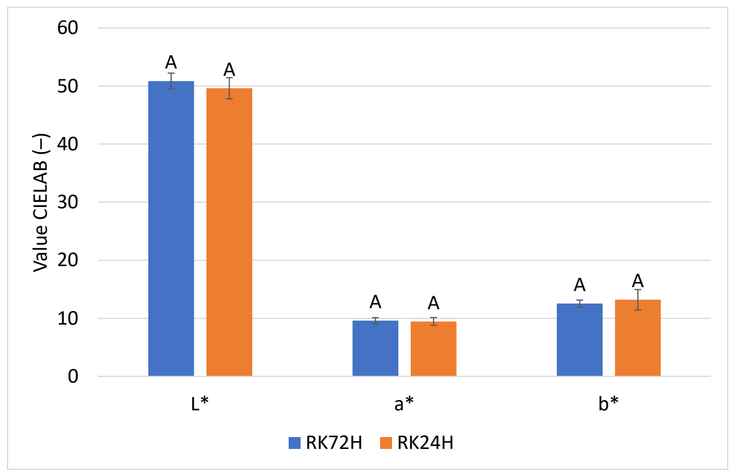


Figure 1: Spectrophotometry determination of colour in sausages on cut with different maturity of fish meat

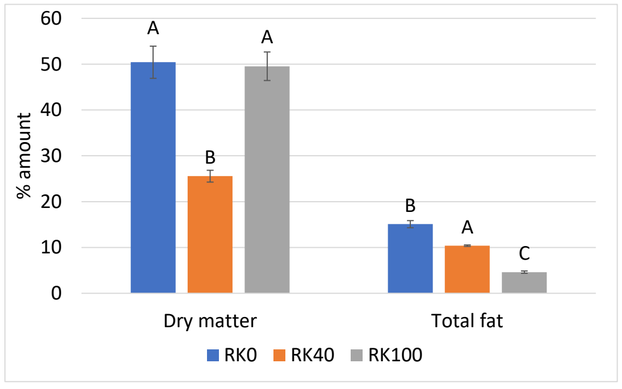


Figure 2: Procentual amount of dry matter and fat in sausages with different addition of fish meat

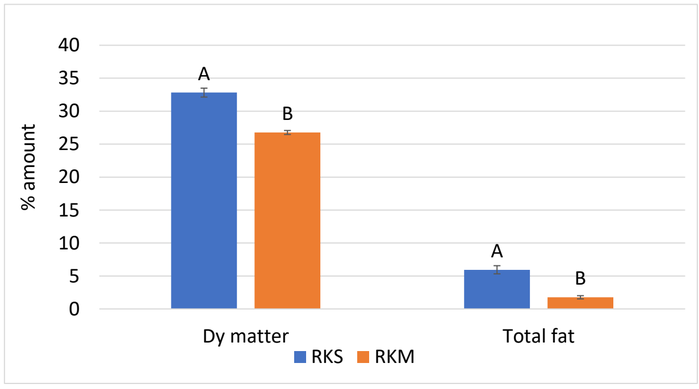


Figure 3: Procentual amount of dry matter and fat in sausages with 100% addition of fish meat and different age/size of fish

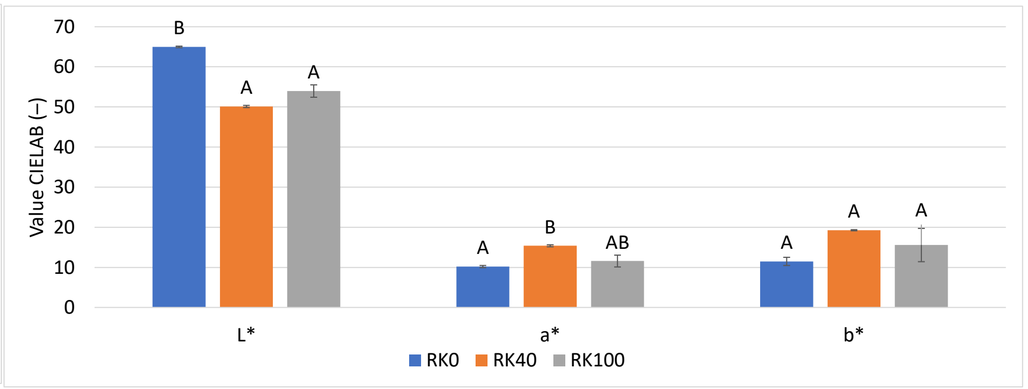
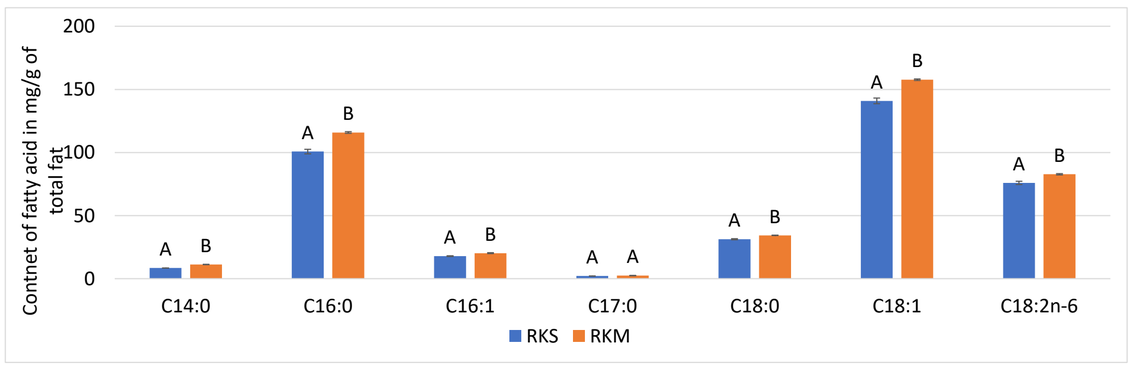


Figure 4: Spectrophotometry determination of colour in sausages on cut with different addition of fish meat



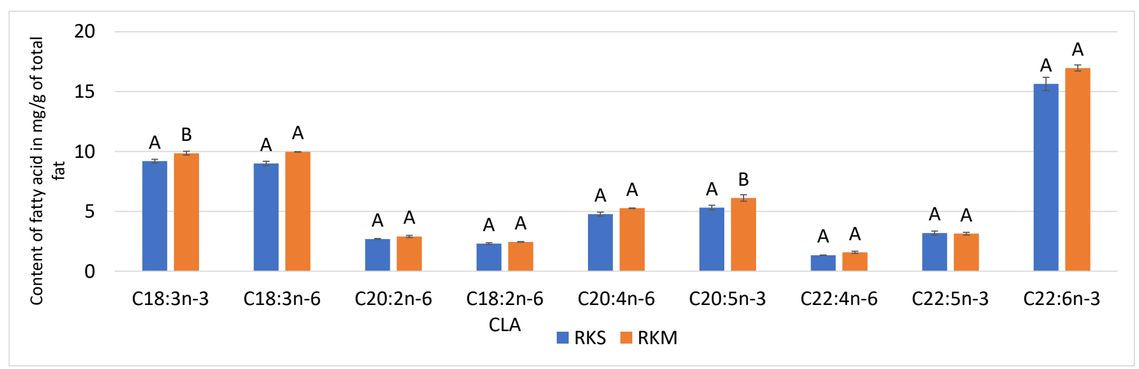


Figure 4a-b: Comparing of content of fatty acids in different age/size fish in sausages with 100 % addition of fish meat

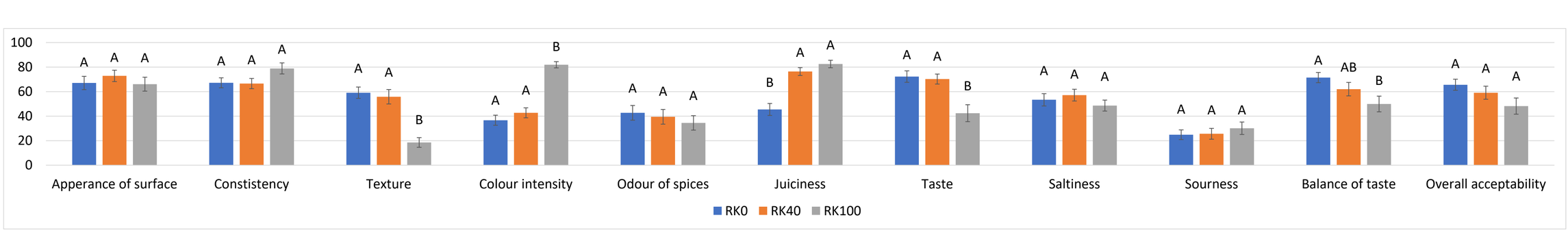


Figure 5: Sensory evaluation in sausages with different addition of fish meat

Conclusion

This work dealt with evaluating the addition of fish meat (*Clarias Gariepinus*) to sausages in terms of dry matter content, fat, color, fatty acid composition, and sensory acceptability of the product. Overall, 7 types of sausages were produced: 3 with the addition of fish meat (0%, 40%, and 100%), 2 with different meat maturation times (24 hours post-slaughter and 72 hours post-slaughter), and 2 with different ages of fish at slaughter (13–15 months, 2000–2200 g; 6–8 months, 800–1000 g). From the analysis of total fat, it was found that with an increasing proportion of fish meat, the dry matter content decreases, which is related to the higher water content in fish meat. However, the total fat content was highest in the sausage with 40% fish meat, indicating a connection with the replacement of lean pork meat with fish meat. Meat maturation had no effect on dry matter and fat content. However, the sausage made from the meat of older fish showed significantly higher values of both fat and dry matter. The different maturity of fish meat did not have a statistically significant effect on the composition of fatty acids ($P < 0.05$). With the increasing addition of fish meat, a significant increase in the EPA content was observed in all the sausages studied. For DHA, the increase in content was statistically significant only for the 100 % sausage compared to the 0 % and 40 % sausages ($P < 0.05$). Instrumental color measurement showed that the location of the color measurement (cut, surface) affects the color, and that the addition of 40% fish meat to pork meat increases color intensity and decreases lightness, compared to 0% or 100% fish sausage. The maturity of the meat had no effect on the color of the sausages. The results of the sensory analysis showed that as the addition of fish meat increases, the acceptability of sausages decreases. The addition of 40 % fish meat significantly increased the juiciness of the product and did not have as negative an effect on the raw taste and texture of the product as 100% fish sausage. Although a trend toward a decrease in overall acceptability values was observed, the sausage types did not differ statistically significantly ($P > 0.05$), and thus the assumption of its reduction with an increasing proportion of fish meat was not confirmed. Based on the obtained results, in terms of increasing the intake of n-3 PUFAs (EPA and DHA) in the diet, it is clearly recommended to include sausages with 100 % fish meat from younger fish.

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