

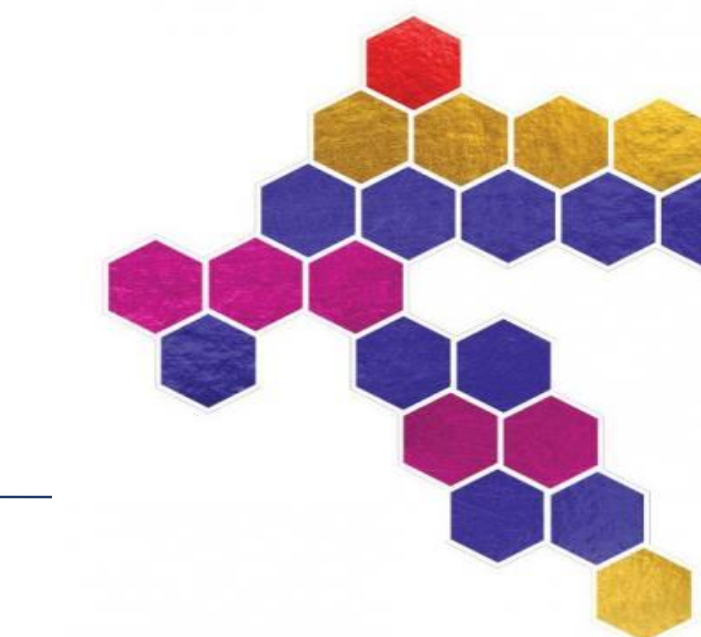


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Research and development of meat products with the aim of reducing added nitrates and nitrites

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INTRODUCTION

Industrial production and food processing nowadays is closely associated to the use of food additives. In the meat industry, they play an important role in preventing the growth of microorganisms, but also in preserving the freshness and consistency of the product and improving its texture. The most commonly used additives for the aforementioned purposes are potassium or sodium nitrates and nitrites, especially due to the effectiveness of nitrites against the bacterium *Clostridium botulinum* and its spores. Additionally, they are responsible for the characteristic organoleptic properties of meat products, primarily the inherent pink color. Environmental factors such as processing temperature, pH value, concentration of sodium chloride and phosphate, and the presence of reducing agents greatly influence the antimicrobial properties of nitrite.

Recent epidemiological research indicates a connection between nitrite, through the formation of N-nitrosamines in the presence of proteins, and some cancerous diseases. In order to reduce the potential danger to human health, a key question arises - how to reduce or eliminate the use of nitrites and nitrates in meat products?

AIM OF THE STUDY

In this research, four groups of meat products are studied: fermented and bologna sausage, cooked ham and mortadella. The aim of the research is the development of products without added nitrites from nitrite salt, as well as with added nitrates from sodium nitrate and natural sources. With addition of a natural source of nitrates, a bacterial culture is also used, the purpose of which is to reduce nitrates to nitrites through bacterial metabolism. The final result are products that retain the same characteristics as those with nitrates and nitrites from nitrite salt and sodium nitrate.

COOKED HAM
MORTADELLA
BOLOGNA
SAUSAGE

Addition of yeast extract
and bacterial culture

Meat products without added
nitrites/nitrates

FERMENTED
SAUSAGE

Addition of sea salt and
bacterial culture

Meat products without added
nitrites/nitrates

FERMENTED
SAUSAGE
COOKED HAM
MORTADELLA
BOLOGNA
SAUSAGE

Addition of natural nitrate
source and bacterial culture

Meat products with reduced
content of nitrites/nitrates

MATERIALS AND METHODS

Sample preparation:

5g of homogenized sample is dissolved in 50 mL of warm distilled water, thermostated for 15 minutes and cooled to room temperature. Buffer solution is added, Carrez solution I and II, and the 100 mL flask is filled up to volume. Finally, the sample is filtered through 110 mm filter paper and used for further analysis.

Nitrates:

Instrument - Shimadzu LC20AT
Detector: DAD, detection at 201 nm
Mobile phase - n-octylamine in 20% methanol, pH adjusted to 6.5, isocratic elution
Column - Zorbax Eclipse XDB-C18, 4.6x150 mm, 5µm, column temperature set to 30°C
Total flow: 1 mL/min
Injection volume: 10µL

Nitrites:

- 17% HCL + sulfanilamide + N-(1-naphthyl)-ethylenediamine
- Add 5 mL of aliquote
- Leave in dark for color development
- Measure at 538 nm on spectrometer (Shimadzu UV-1601)

CONCLUSION

Preliminary results obtained by statistical data processing determine that there is a significant difference in the concentration of nitrites in recipes for thermally processed meat products. For fermented sausages a significant difference in nitrate concentration is observed between recipe with sodium nitrate compared to those with sea salt and bacterial culture and with natural source of nitrates. Further studies will be required for implementing final project results into meat industry products.

RESULTS AND DISCUSSION

Table 1. Comparison of concentrations of sodium nitrites in different recipes of meat products

Post-hoc test: Dunn	P value			
	Mortadella	Bologna sausage	Cooked ham	Fermented sausage
REC1 vs. REC2	<0,001	<0,001	0,113	0,317
REC1 vs. REC3	0,171	0,003	0,782	0,334
REC1 vs. REC4	0,134	0,001	0,252	0,190
REC2 vs. REC3	0,003	<0,001	<0,001	0,332
REC2 vs. REC4	0,001	0,013	<0,001	0,249
REC3 vs. REC4	0,716	0,013	<0,001	0,583

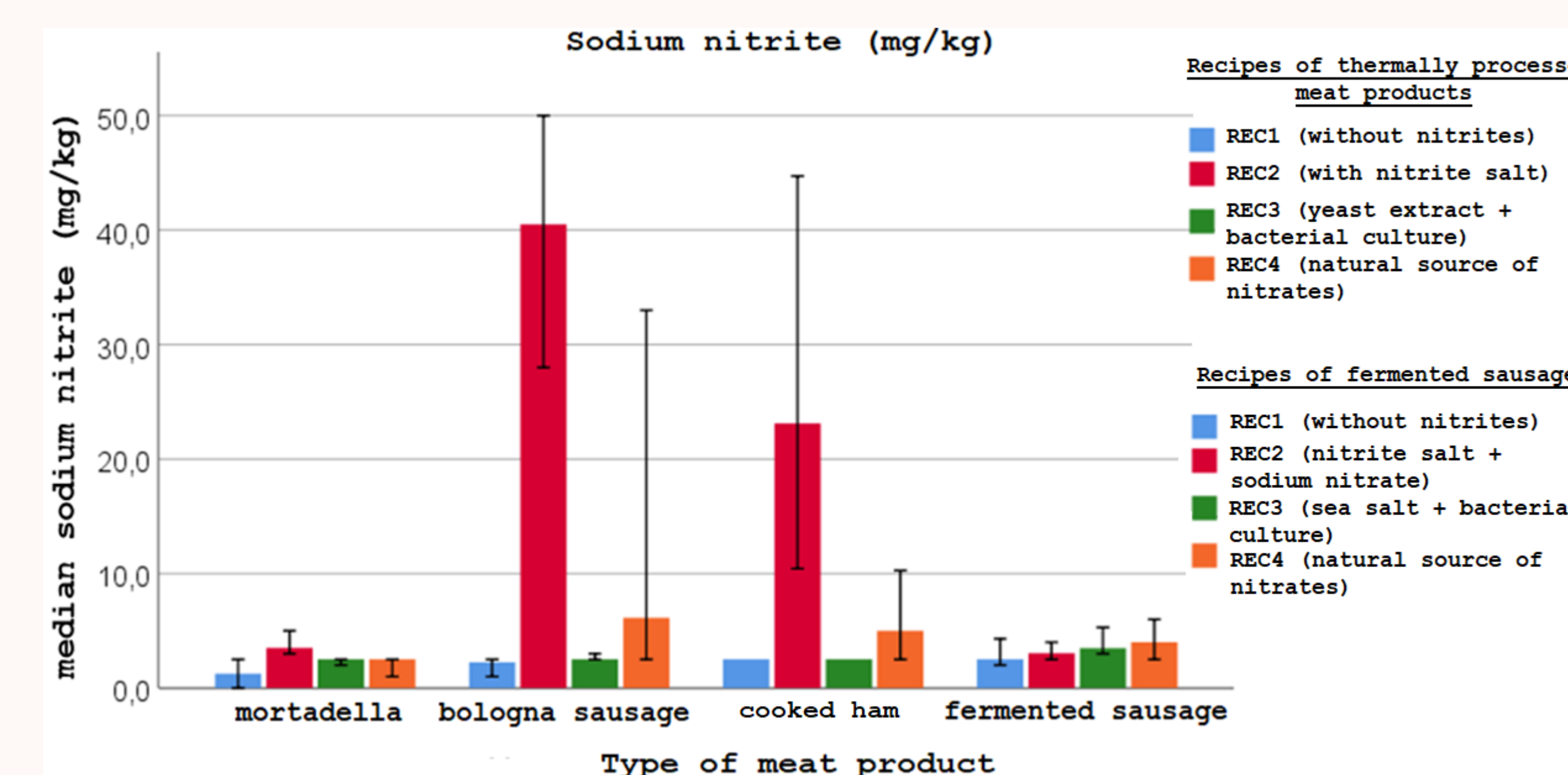


Table 2. Comparison of concentrations of sodium nitrates in different recipes of meat products

Post-hoc test: Dunn	P value			
	Mortadella	Bologna sausage	Cooked ham	Fermented sausage
REC1 vs. REC2	0,036	0,029	0,705	<0,001
REC1 vs. REC3	0,204	0,446	0,763	1,000
REC1 vs. REC4	1,000	0,034	0,353	1,000
REC2 vs. REC3	0,514	0,009	0,804	<0,001
REC2 vs. REC4	0,017	0,330	0,057	<0,001
REC3 vs. REC4	0,144	0,004	0,015	1,000

