

THE USE OF MULTILAYER CHITOSAN/FURCELLARAN MINI/NANOEMULSIONS WITH OREGANO ESSENTIAL OIL FOR PRESERVATION OF PERISHABLE FOOD PRODUCTS

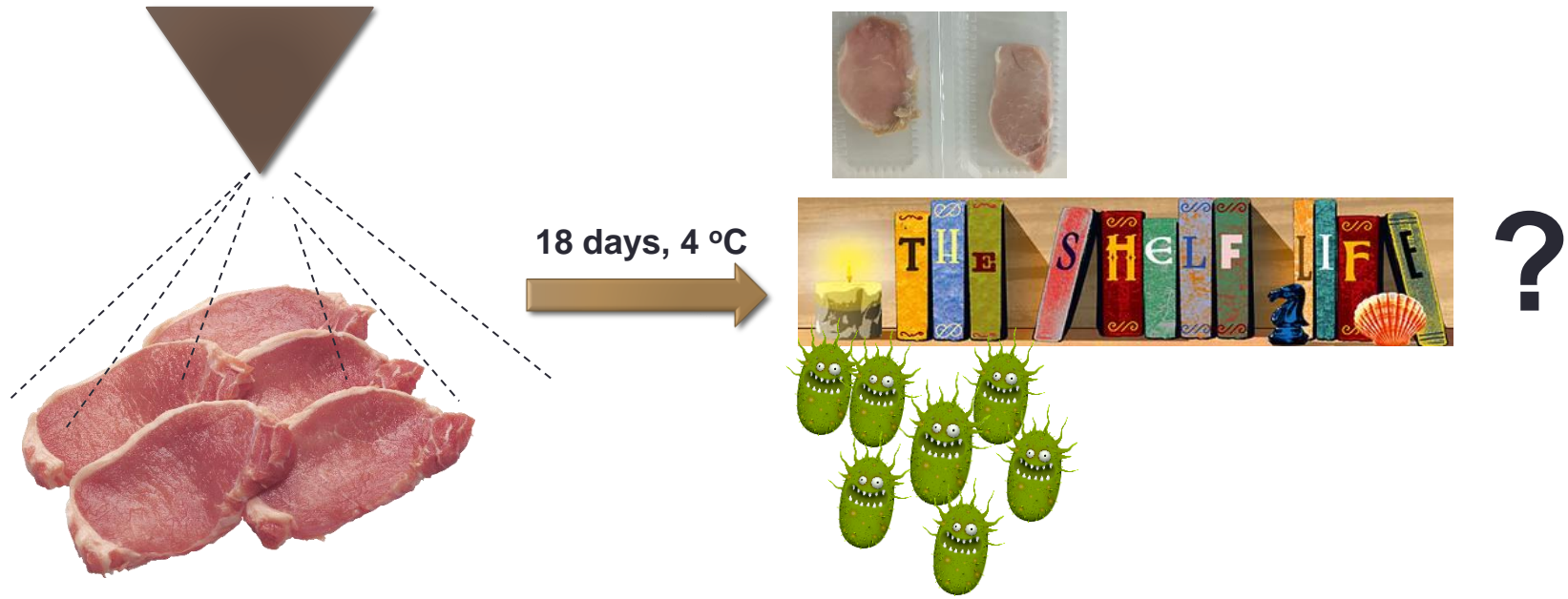
Piotr Kulawik

University of Agriculture in Kraków



Objectives

The possibility of shelf-life extension by newly developed multilayer furcellaran/chitosan nano/microemulsions with oregano essential oil of model perishable products - fresh pork loin and Atlantic mackerel stored at 4°C for 18 days.



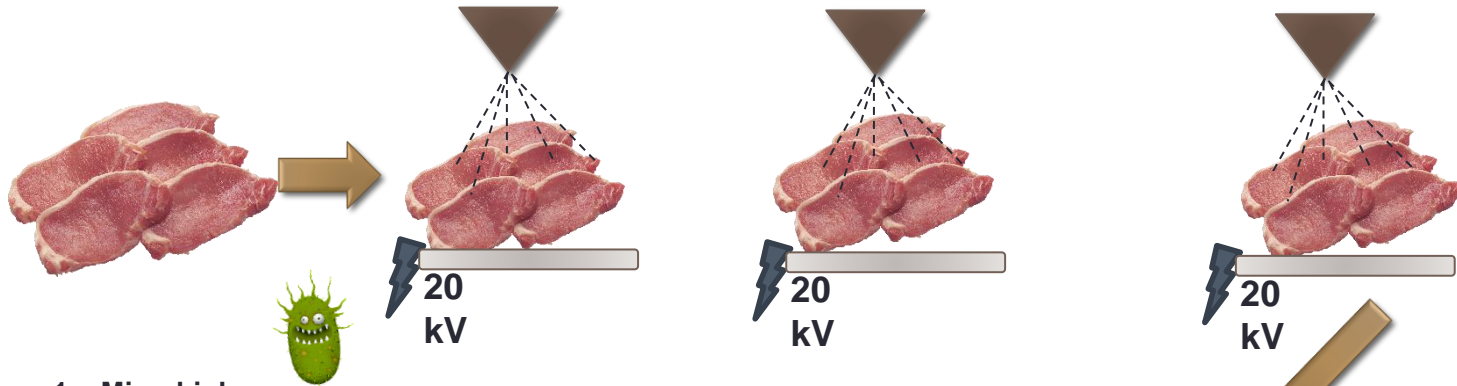
Materials and Methods

Electrospraying

Layer I
CHIT and EO miniemulsion

Layer II
FUR and EO nanoemulsion

Layer III
CHIT and EO miniemulsion



1. Microbiology:

- Total viable count (TVC)
- Psychrotrophic bacteria (PB)
- Yeasts and moulds (YM)

2. Sensory evaluation

- 8-person sensory panel
- Consumer acceptance

18 days, 4°C



Traysealing in PP packages

Experiment conducted with three independent repetitions

Materials:

- Chitosan 0.1% (CHIT)
- Furcellaran 0.1% (FUR)
- Oregano essential oil 0.06% (EO)

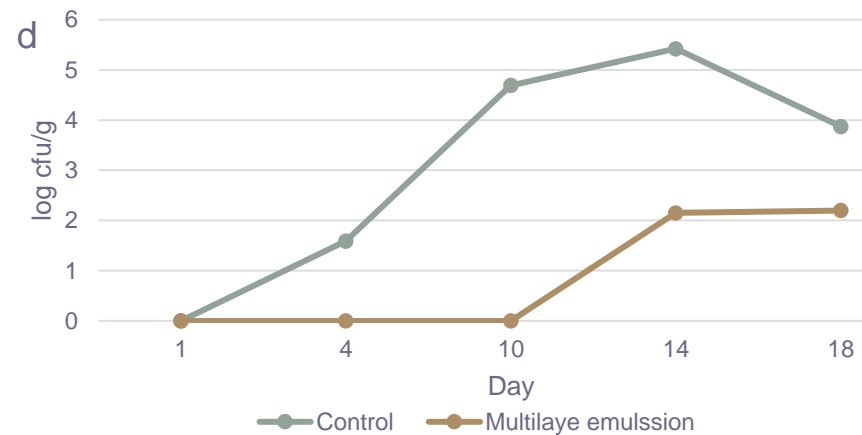
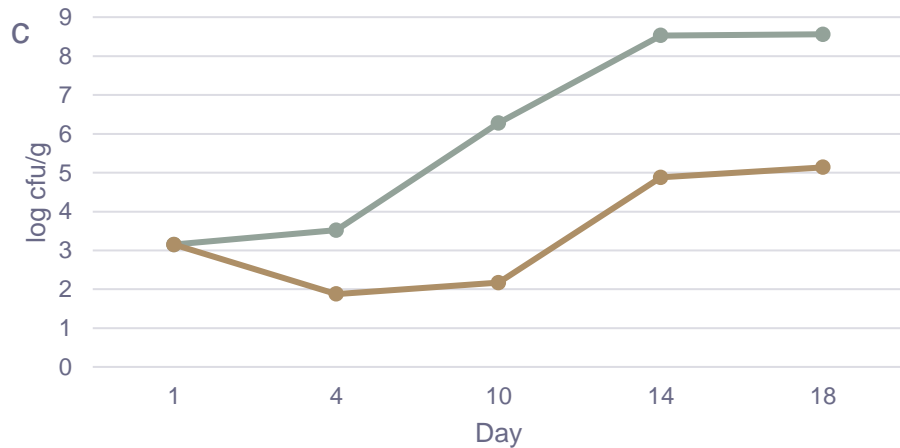
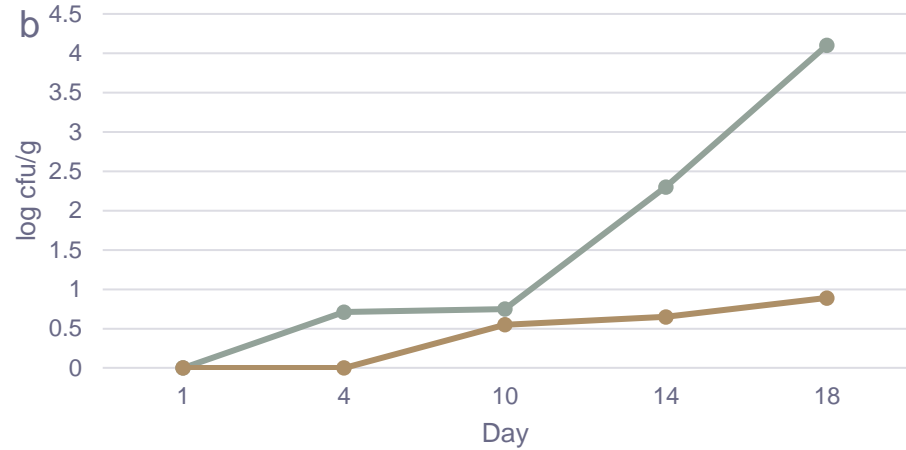
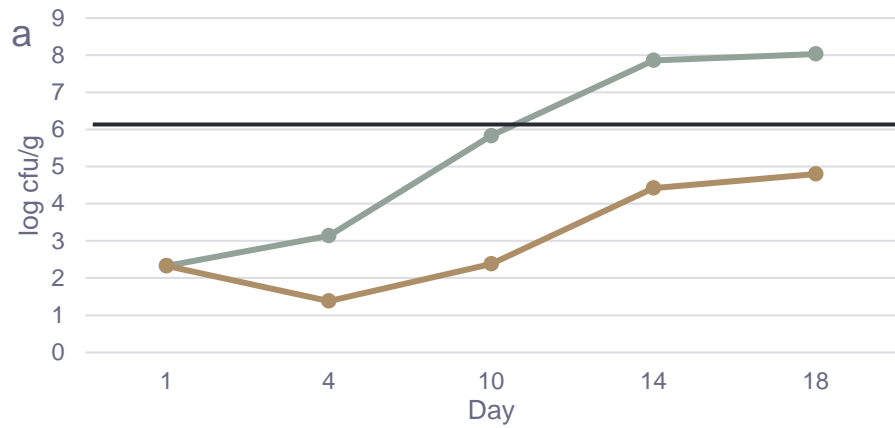


Minimum inhibitory concentration (MIC)

Microorganism	FUR/oregano EO nanoemulsion	CHIT/oregano EO miniemulsion
<i>Staphylococcus aureus</i>	>90%	3.12%
<i>Enterococcus faecalis</i>	>90%	6.25%
<i>Escherichia coli</i>	>90%	3.12%
<i>Salmonella enteritidis</i>	>90%	3.12%
<i>Pseudomonas aeruginosa</i>	>90%	1.60%
<i>Candida albicans</i>	50.00%	12.5%
<i>Aspergillus flavus</i>	70.00%	50.00%
<i>Aspergillus brasiliensis</i>	70.00%	25.00%

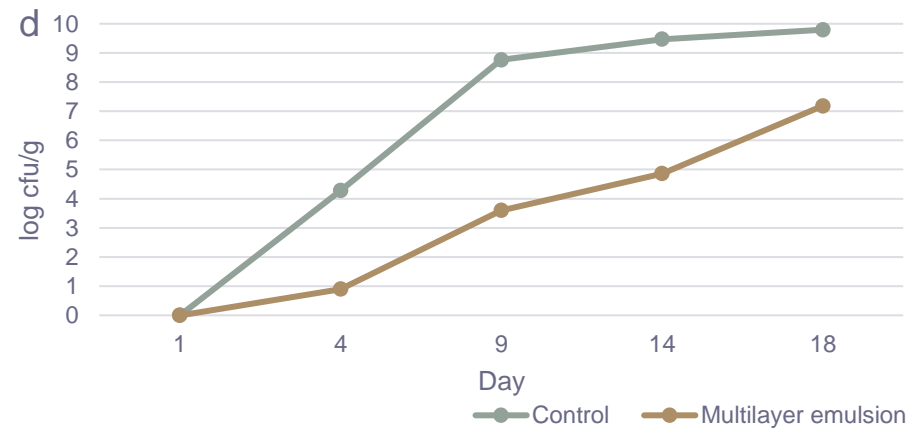
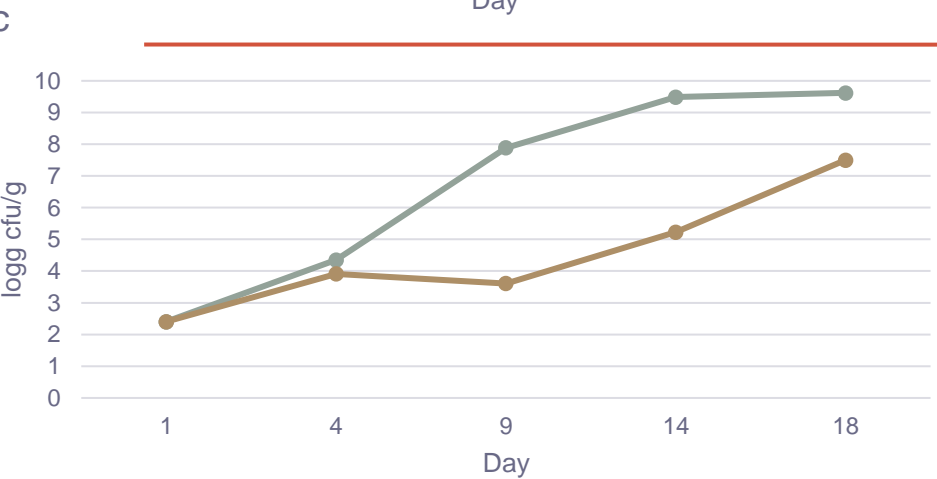
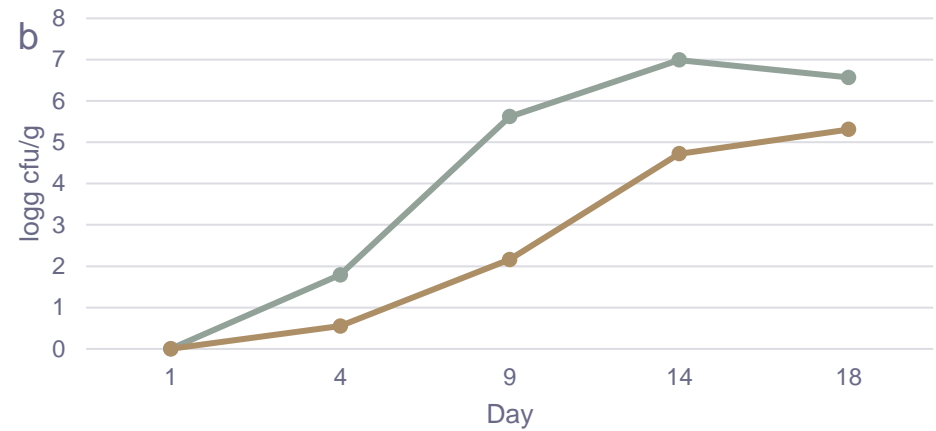
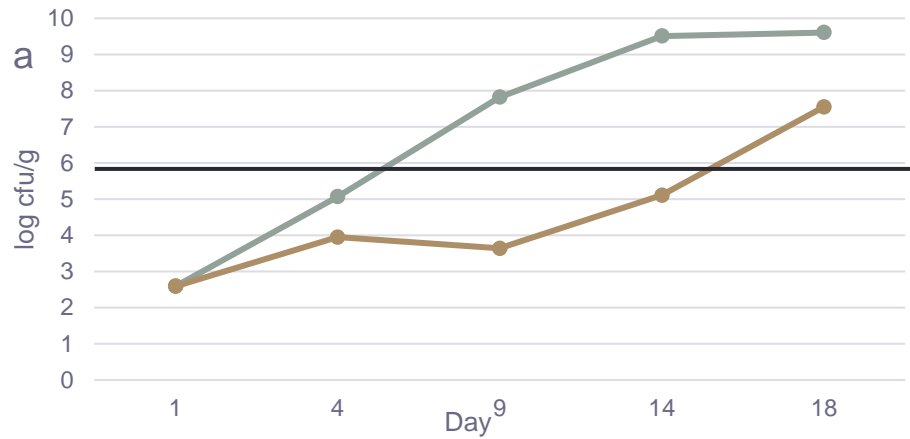
Results showed as % of emulsion in the solution, which resulted in complete growth inhibition

Results – microbiology – Atlantic mackerel



A – TVC; B – Yeasts and mould; C – Psychrotrophic bacteria; D - Pseudomonas spp.

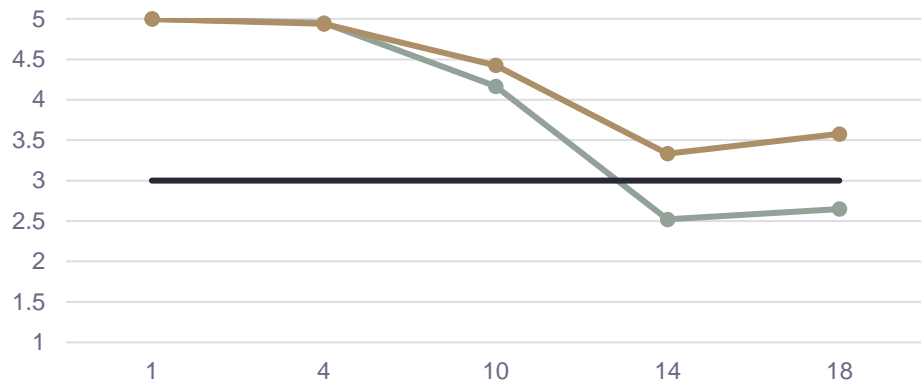
Pork loin - microbiology



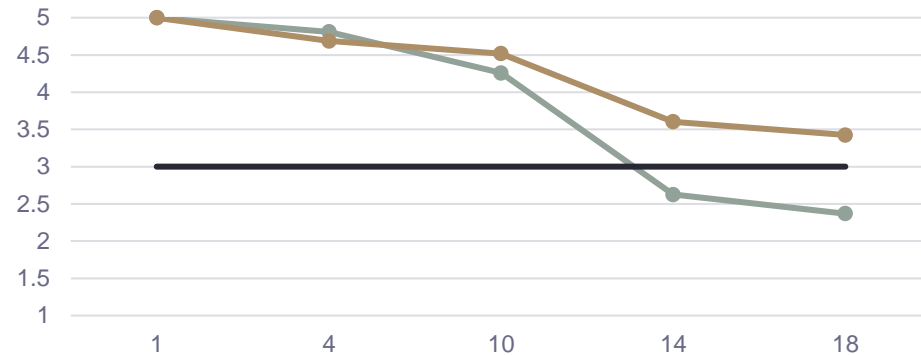
A – TVC; B – Yeasts and mould; C – Psychrotrophic bacteria; D - Pseudomonas spp.

Results – sensory of Atlantic mackerel

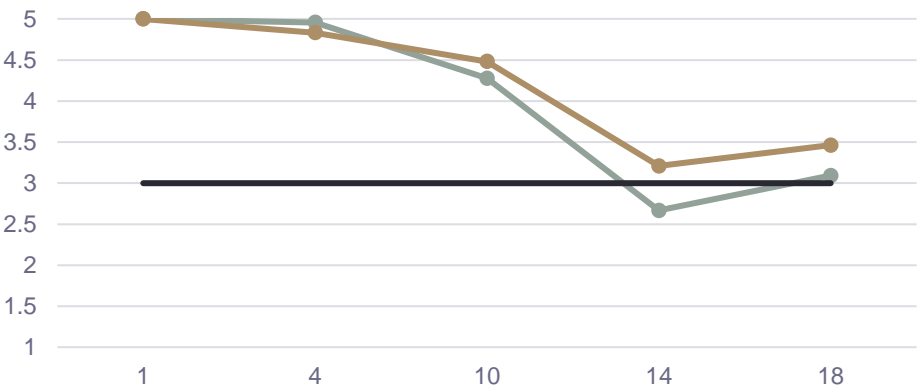
Skin color



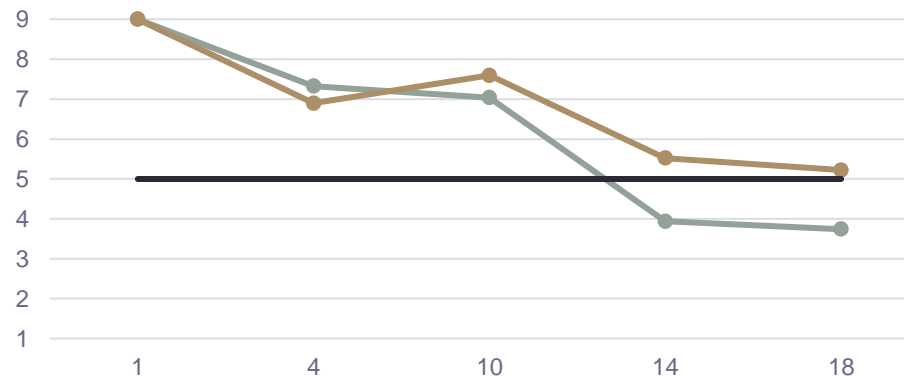
Odor



Texture



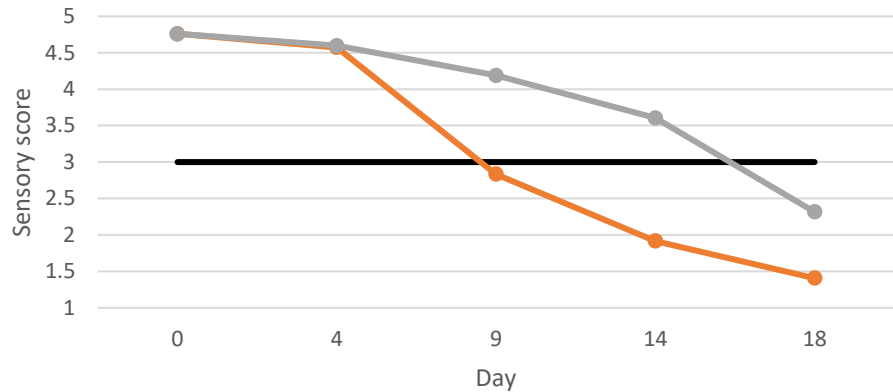
Overall appearance



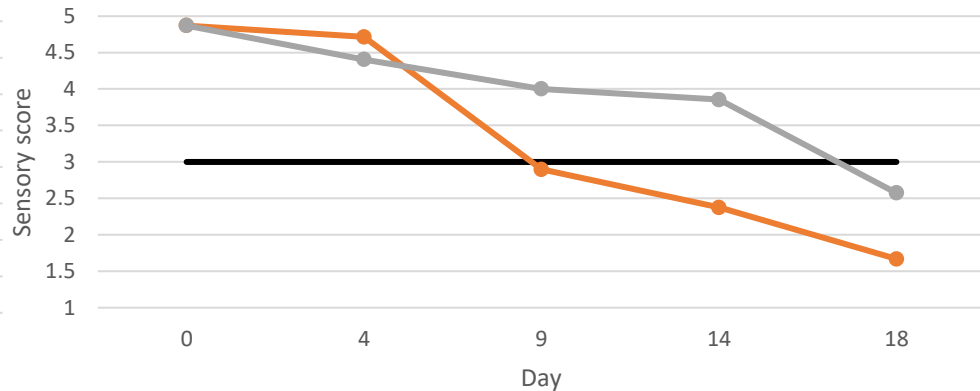
● Control ● Multilayer emulsion — Acceptability limit

Results – sensory of pork loin

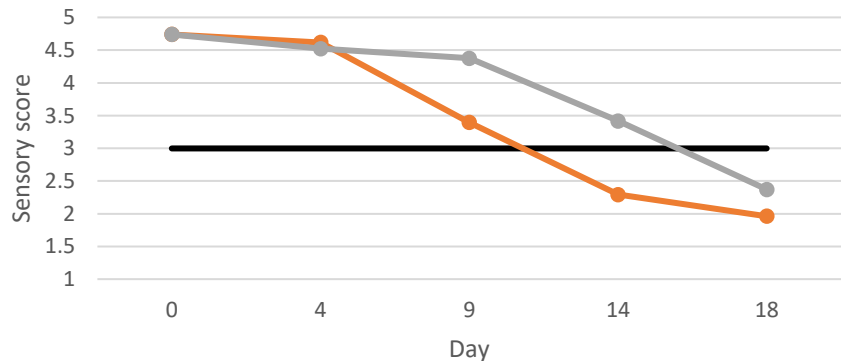
Colour



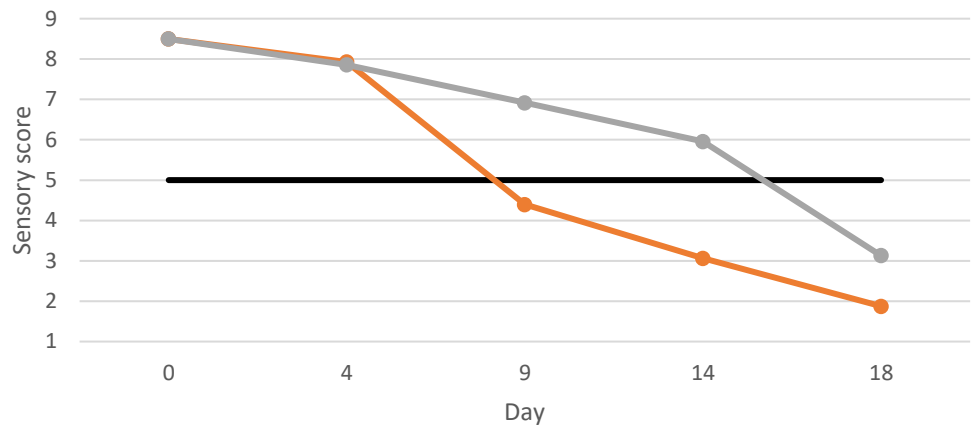
Odour



Texture



Overall appearance



— Acceptance limit ● Control ● Multilayer emulsion

Results – appearance of product after 14 days



Results – appearance of product after 14 days

Control



Coatings



Consumer analysis on salmon fillet

- Analysis of sensory properties and value for the consumer
- Research question – whether consumer will notice the coating and how it will affect the product's value
- Both odor and its intensity were comparable in both groups.
- Consumers could not distinguish control from coated groups
- Presence of coatings significantly increase:
 - Overall quality score
 - Freshness score
 - Willingness to buy
- Conclusions: coatings were not visible for the consumers and improved its value for the consumer unaware of its existence

Consumer analysis on pork loin

- Consumers were more convinced that the control sample had a coating on it than the samples with a coating
- Differences were statistically significant however the effect size was low ($d = 0.171$)
- The analysis of sample gloss measured using Just About Right scale (1-7 with 4 meaning „ideal” showed that gloss of treated samples was more close to ideal than of control samples (4.703 ± 1.576 vs 5.247 ± 1.449).
- Conclusion: consumers did not notice the coating on the product

Application cost?

Based on lab-scale experiment:

	1 kg pork loin	1 kg mackerel
Amount of CHIT/oregano EO emulsion	100 mL	35 mL
Amount of FUR/oregano EO emulsion	50 mL	17,5 mL
Ingredient cost	0.10 EUR	0.03 EUR

Conclusions

- Coatings significantly inhibited microbiological growth
- Coatings significantly improved sensory scores of stored samples
- Oregano aroma could be noticed for some of the coated samples by the sensory panel, but not by the consumers
- The difference in appearance between treated and control samples was not distinguishable for the consumers
- Coatings successfully prolonged the shelf-life of the model meat and fish products

Thank you for attention

Happy to answer all your questions