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FINAL CONGRESS OF THE FREEZEWAVE PROJECT

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- A few words about us
- Objectives
- Material & Methods
- Results
- Conclusions

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Freezewave

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ACTIVITIES

- Innovation management
- Technology transfer
- Research and development
- Contract research
- Network management
- Training

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INFRASTRUCTURE

- 1000 m² experimental facilities
- Food and bakery pilot plant
- State of the art analytics (chemical, physical, microbiological)
- Sensory lab
- Cooking lab
- Meeting and seminar rooms

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FREEZEWAVE: OUR OBJECTIVES

- Determine appropriate microwave freezing parameters for cod filet
- Evaluate the impact of microwave freezing on fish properties as compared to static freezing and fast freezing

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MATERIAL & METHODS: MICROWAVE FREEZING EQUIPMENT

- Modified freezing cabinet Acfri RS10
  - built-in microwave oven with rotating plate
- Microwave generator Sairem GMS200W
- 1 W / 100 g cod @ 2450 MHz (continuous)
- Freezing at -25 °C and -35 °C

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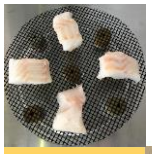
MATERIAL & METHODS: COD FILETS



- *Gadus morhua*
- Wild from Northern Atlantic (Iceland)
- Fileting in Bremerhaven
- Comparison of left and right side from the same animal to minimize variability
- 90 g portions

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MATERIAL & METHODS: FIXATION AND STAINING

- Cutting of small frozen fish samples (scalpel) ⊥ muscle cell orientation
- Carnoy bath > Ethanol bath > Methylcyclohexane > Paraffin
- Microtome slicing
- Staining
- Microscopic observation

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MATERIAL & METHODS: WEIGHT LOSS DURING FREEZING, THAWING AND COOKING

- Freezing in experimental system with and without microwaves
- Storage for 2 weeks at -19 °C
- Thawing for 24 h at +4 °C
- Cooking at 75 °C for 40 min

- Weighing after each step

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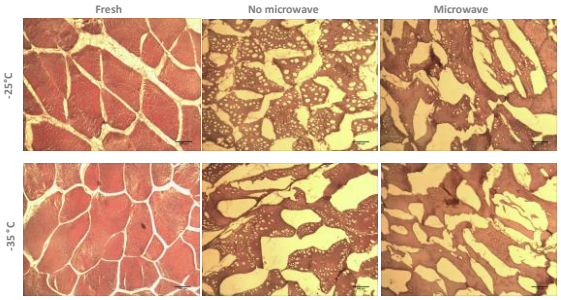
RESULTS: MICROSCOPIC STRUCTURE



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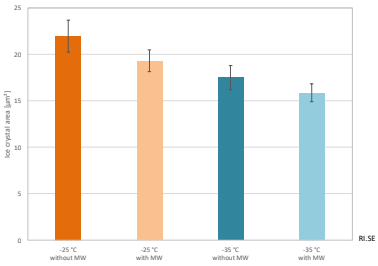
RESULTS: MICROSCOPIC STRUCTURE



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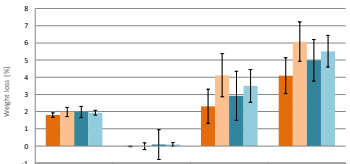
RESULTS: WEIGHT LOSS DURING FREEZING AND THAWING



	Freezing	Frozen storage	Thawing	Total
-25 °C without MW	1,80	-0,02	2,31	4,10
-25 °C with MW	1,98	-0,02	4,12	6,08
-35 °C without MW	1,98	0,08	2,93	4,99
-35 °C with MW	1,94	0,09	3,49	5,52

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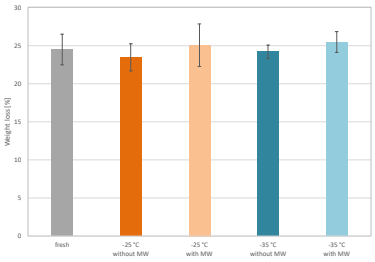
RESULTS:
WEIGHT LOSS DURING COOKING



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CONCLUSIONS

- Microwave application during freezing reduces the size of intracellular crystals
- However, the loss of weight during thawing and cooking is slightly increased by microwave application
- Further research is needed to better understand the mechanisms of these phenomena

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