Effect of drying methods on the properties of mixtures of aromatic plants for gastronomy using different encapsulated agents

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1 – Introduction – Key facts

High sodium consumption and insufficient potassium intake contribute to high blood pressure and increase the risk of heart disease and stroke

9–12 grams / day – average salt consumption

WHO Member States have agreed to reduce the global population's intake of salt by a relative 30% by 2025

Reducing salt intake has been identified as one of the most cost-effective measures countries can take to improve population health outcomes

An estimated 2.5 million deaths could be prevented each year if global salt consumption were reduced to the recommended level

1 – Introduction – What is salt used for?

sodium	chlorine
11	17
Na	Cl
22.990	35.453

FOOD & FEED
Salt provides: flavour, preservation and functionality to food

Salt types:

- Table salt
- Kosher salt
- Sea salt
- Himalayan salt
- Celtic sea salt
- Salt flower
- Kala namak ("black salt")
- Flake salt
- Black Hawaiian salt
- Red hawaiian salt
- Smoked salt
- Pickling salt

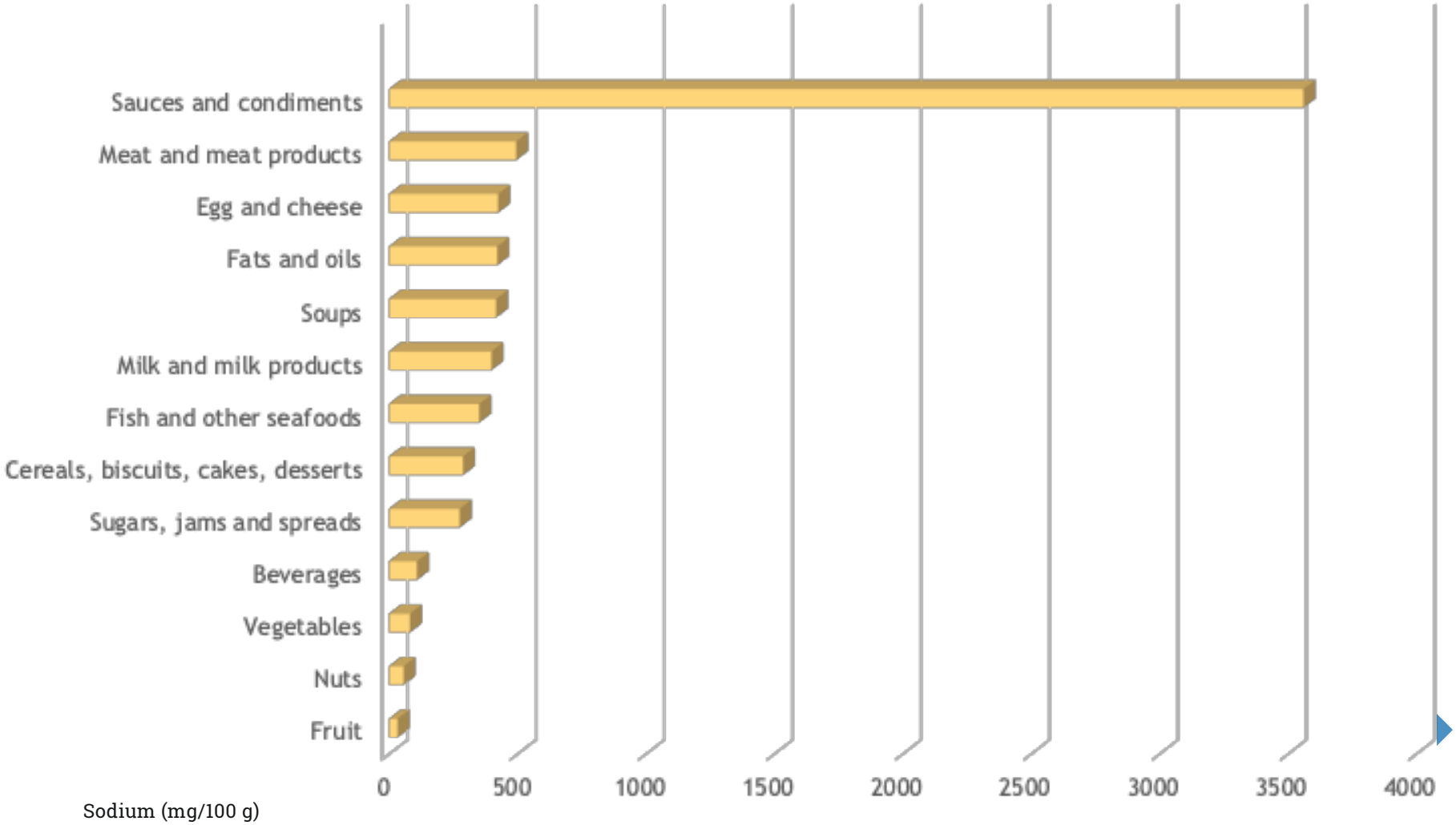
Table salt

Food industry

- Meat/Sausage products
- Cheese/Dairy products
- Bread/Bakery products
- Fishery industry
- Spices

By weight, all types of **salt** are 30-40 % **sodium**

1 – Introduction – Salt content in food products



1 – Introduction – Innovative uses of table salt products

Classic: salt and aromatic plants

Less Salt: Sodium Chloride and Potassium chloride

No salt: Potassium Chloride and aromatic plants and spices

No salt: Potassium Chloride and extracts of aromatic plants and vegetables

No salt: Potassium Chloride and others

No Sodium Chloride and Potassium Chloride: Aromatic plants and vegetable extracts

1 – Introduction – What are oleoresins used for?

Oleoresins

Substitute for the ground spice with standardized taste and aroma, which can be tailored as per the requirement of the product. This can be attributed to its longer shelf-life, less possibility of bacterial contamination, and ease of storage and transport.

Major products:


paprika


black pepper


capsicum


turmeric


garlic


ginger


onion


cinnamon


coriander


rosemary


fenugreek


bay leaves

1 – Introduction – How oleoresins are extracted and used?

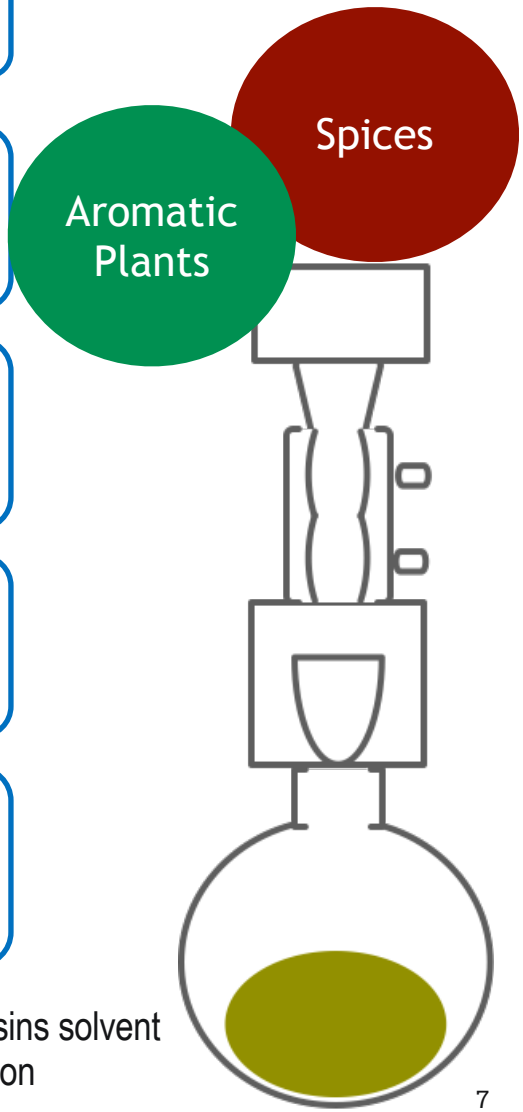
Extraction
- Solvent extraction of the dried spice

Extracts
- Liquid (sorbitol syrup), emulsified (sunflower oil) and dry product form (salt)

Uses
- High temperature applications (baking and frying)
- From convenience foods, snacks and delicatessen, to dairy products, meat, bakery products and frozen foods

Safety
- High levels of microbiological safety; Standardised quality;
- Maximum hygiene standards;Long shelf life with no loss of quality

Quality
- Flavour profiles close to the natural spice;
- High extract concentration;
- Reliable product properties



Oleoresins solvent extraction

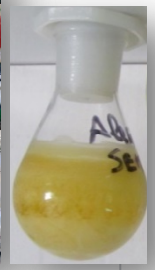
2 – Aims

Produce a microencapsulated mixture of oleoresins aromas and flavours to reduce salt in gastronomy;

Investigate the potential of two different types of coating material obtained by spray and freeze drying processes to use in food industry;

Identify the compounds from the two coating material microcapsules obtained by the two processes.

3 – Experimental work - methodology



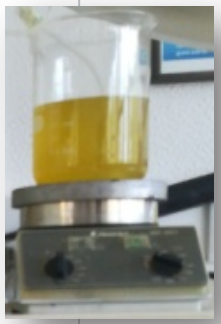
Plant material

Solid liquid extraction; Solvent removal

Dry extract; Micro-encapsulation

Freeze-drying; Micro-capsule

Spray-drying; Micro-capsule



4 – Results: Physicochemical properties of microcapsules

TABLE 1. Yields and physicochemical properties of microcapsules obtained by SD and FD process for inulin and maltodextrin microcapsules.

	Spray drying (SD)				Freze drying (FD)			
	Inulin		Maltodextrin		Inulin		Maltodextrin	
	M	F	M	F	M	F	M	F
Yields (%)	69,36	67,52	72,55	43,15	86,86	91,38	84,82	83,31
Encapsulation efficiency (%)	79,81	79,61	98,63	71,54	85,19	88,54	84,90	74,00
Wa	0,230	0,200	0,217	0,260	0,250	0,257	0,333	0,321
Solubility (%)	52,37	49,00	49,43	51,83	51,19	50.99	48,95	47,6
Hygroscopicity (%)	10,66	6,68	4,46	10,24	13,75	12,98	11,60	9,28
Color								
L*	97,22	95,63	96,63	95,52	98,86	98,73	99,04	98,86
a*	-1,15	-3,32	-1,01	-3,48	-0,32	-0,25	-0,63	-0,20
b*	5,09	11,83	5,17	11,99	2,00	2,35	2,68	1,52

Note: mean values

Microcapsules with high yields products, high encapsulation efficency and high stability at microbiological level (Wa<0,3);Similar solubility; different color

5 – Microparticle characterization by SEM analysis

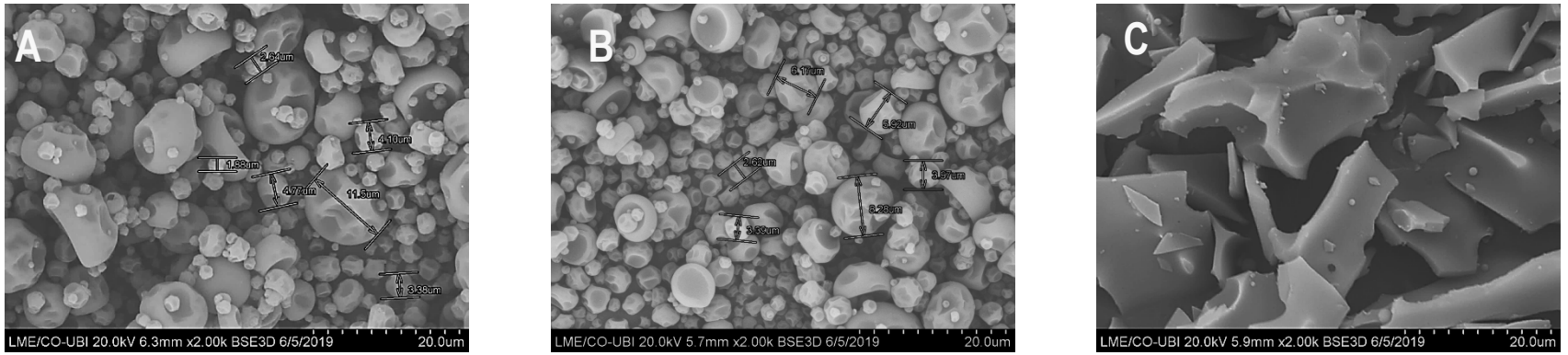


FIGURE. 7 Scanning electron microscopic photographs of microcapsules for: Inulin microcapsules of Fish oleoresins – magnification x 2000 (A); Meat oleoresins - magnification x 2000 (B) obtained by spray-drying ; Fish oleoresins – magnification x 2000 (C) obtained by Freez- drying.

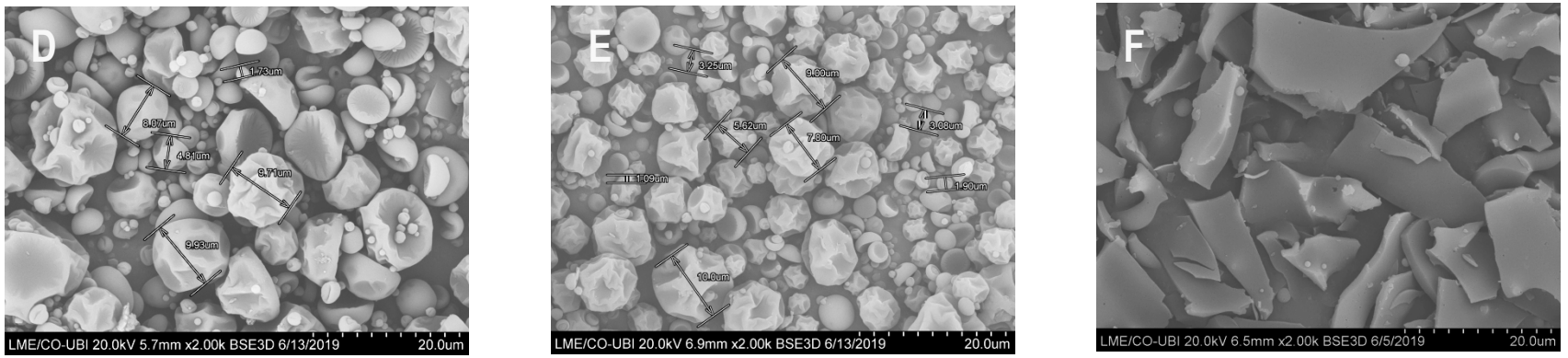


FIGURE. 8 Scanning electron microscopic photographs of microcapsules for: Inulin microcapsules of Fish oleoresins – magnification x 2000 (D); microcapsules of Meat oleoresins magnification x 2000 (E) obtained by spray-drying;Meat oleoresins magnification x 2000 obtained by Freez- drying.

Spray drying and freeze drying processes produces microencapsules with different morphologies;
The size of the microcapsules varies between 1-12µm

6 – Results: Total phenolic compounds of microcapsule extracts

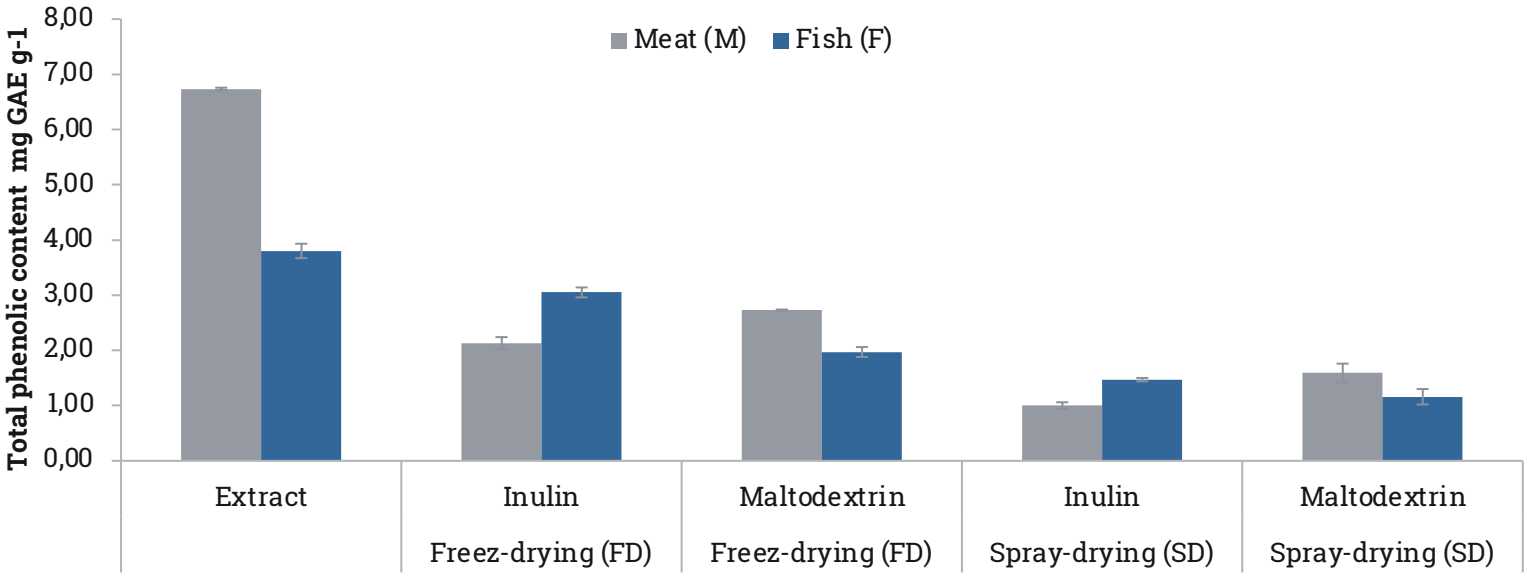


Figure 1: TPC in Inulin and maltodextrin microcapsules for 2 types of oleoresins mixtures Meat (M) and Fish (F)

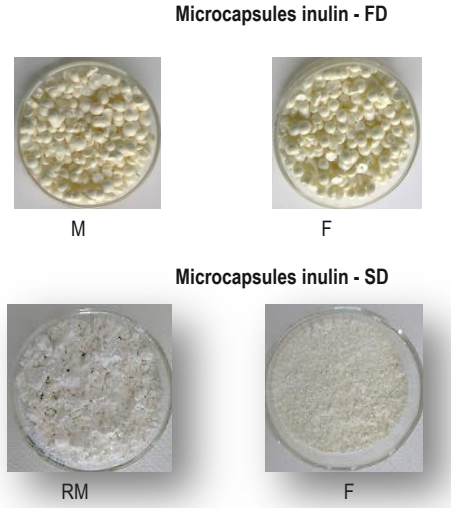


FIGURE 2: Photos of Inulin microcapsules powder for fish oleoresins for freeze drying (FD) and spray drying process.

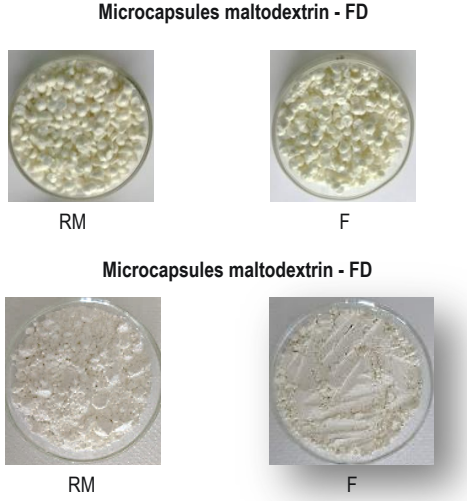
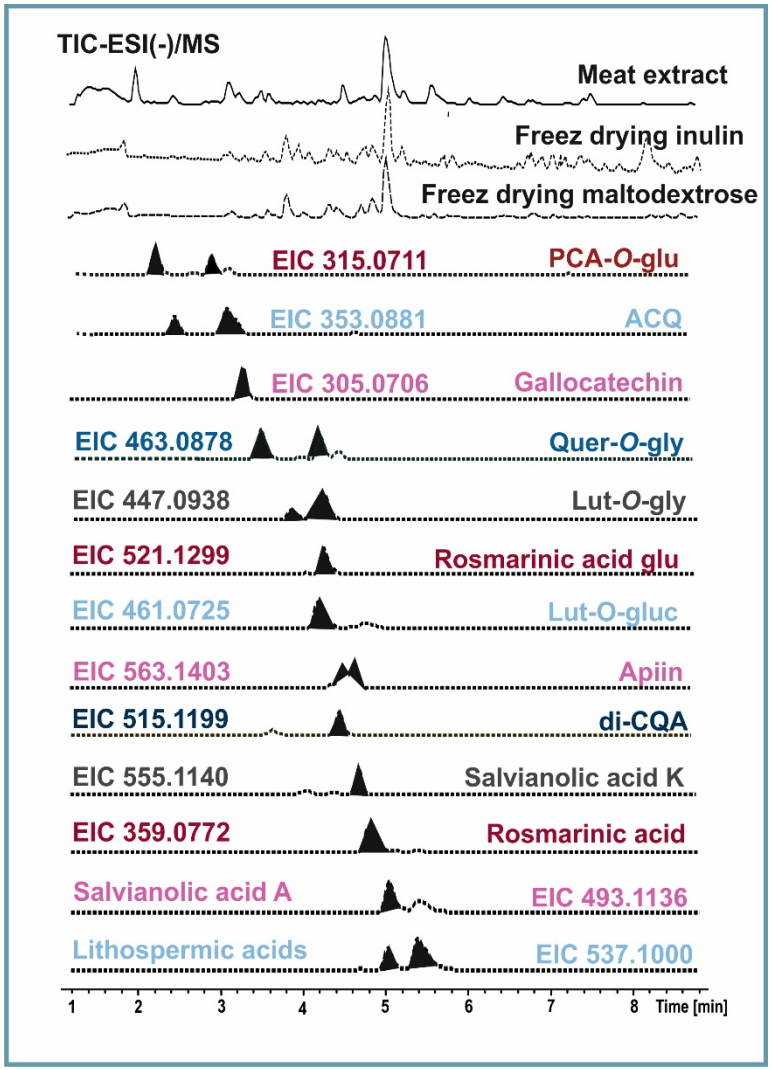


FIGURE 3: Photos of Maltodextrin microcapsules powder for meat oleoresins for freeze drying (FD) and spray drying process.

7 – Screening and characterization of microcapsules extracts



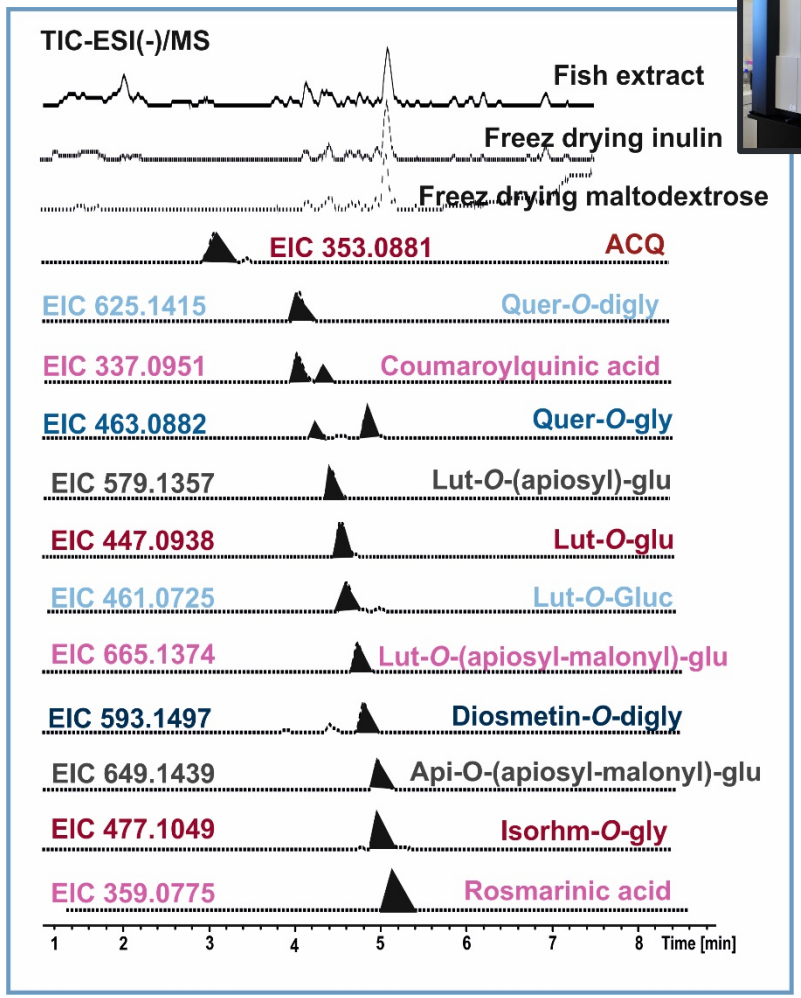


FIGURE 4: Total ion chromatograms in the ESI negative mode for microencapsulates extracts, and extracted ion chromatograms for the main polyphenol compounds present in the extracts.

8 – Screening and characterization of microcapsule extracts

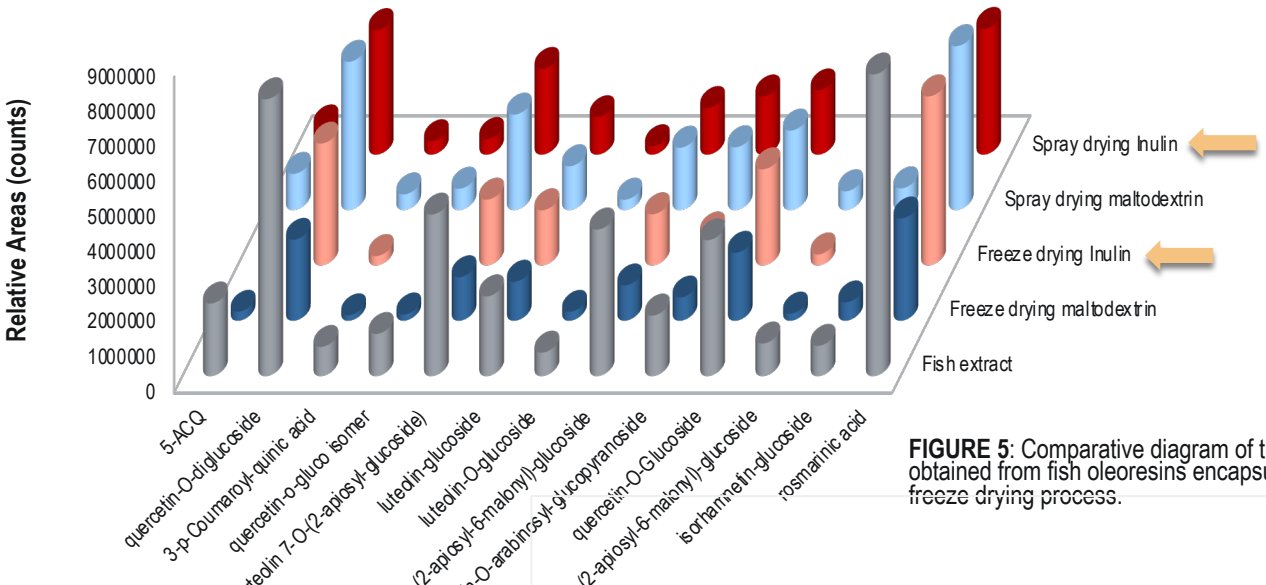


FIGURE 5: Comparative diagram of the relative abundances for phenolic compounds extracts obtained from fish oleoresins encapsulated with inulin and maltodextrin , obtained from spray and freeze drying process.

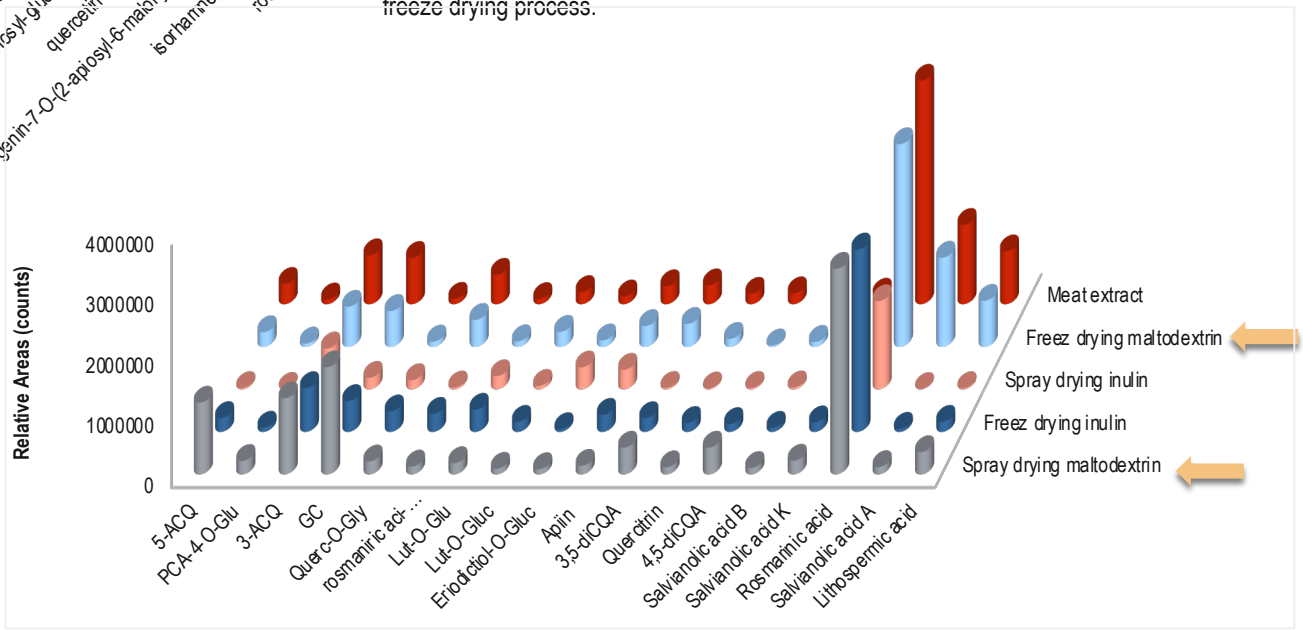


FIGURE 6: Comparative diagram of the relative abundances for phenolic compounds extracts obtained from meat oleoresins encapsulated with inulin and maltodextrin, obtained from spray and freeze drying process.

9 – Conclusions

The microencapsulation of aromatic plant extracts in inulin and maltodextrin with the use of spray-drying as well as freeze-drying processes could be a promising application in food industry and constitute an attractive food additive to reduce salt consumption

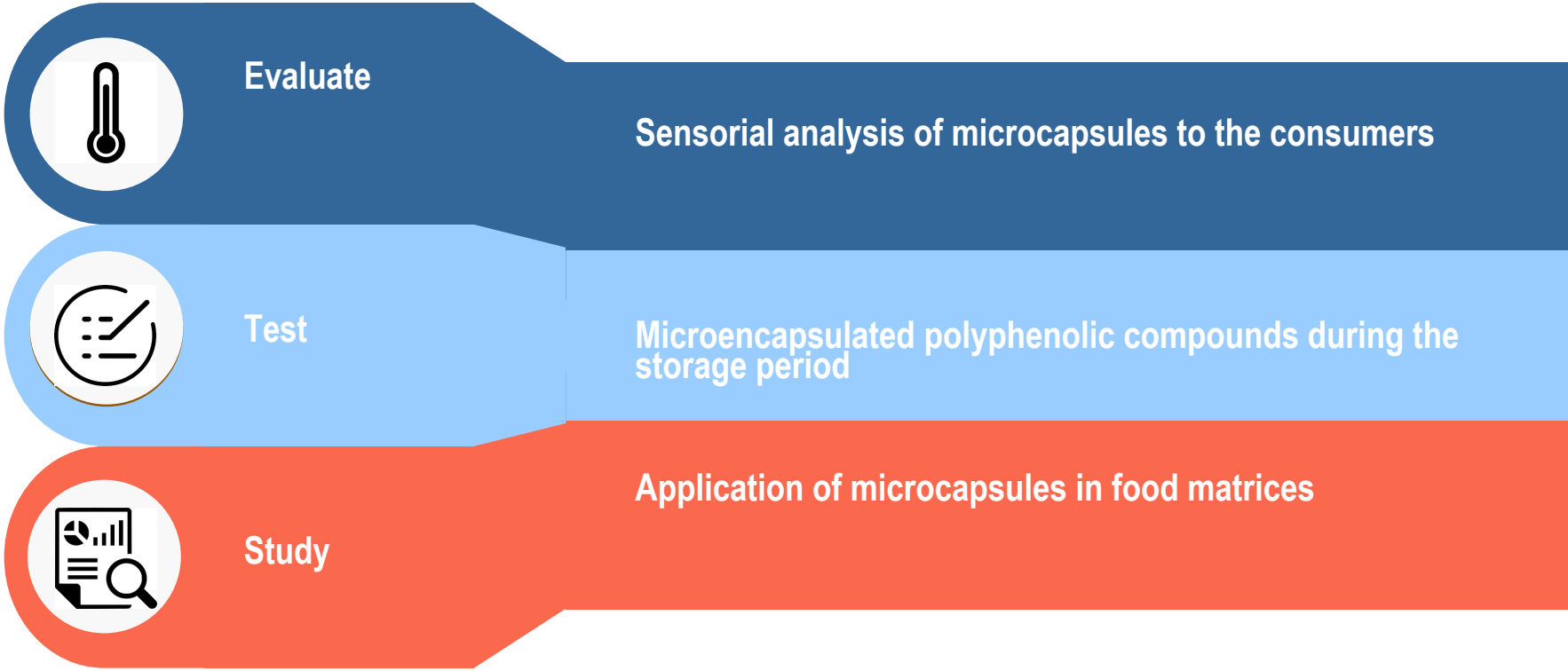
Freeze and spray drying microcapsules presented good quality with high yields, high encapsulation efficiency and good solubility

High diversity of polyphenolic compounds, especially flavones derivatives for fish oleoresins and phenolic acids for meat oleoresins

Spray drying process can offer better application for food industry due to the more regular shape of microcapsules

Best encapsulation results for spray and freeze drying processes: inulin for fish flavors and maltodextrin for meat flavors

10 – Further Expectations



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Thank You!

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