A novel strategy to incorporate coconut oil in dairy matrices

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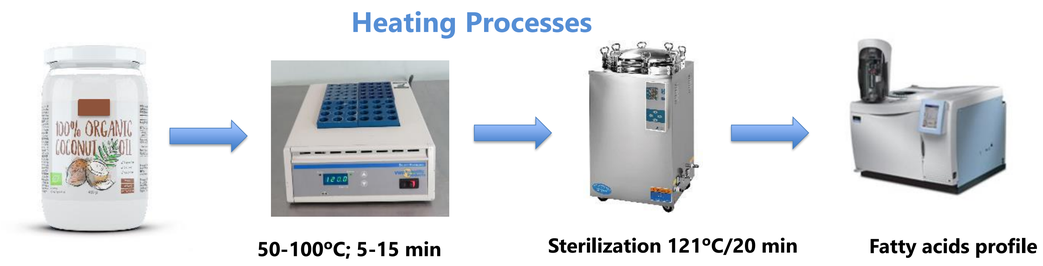
Abstract

Recent epidemiological studies on coconut oil consumption demonstrated several benefits in human health, such as body weight management, anti-inflammatory effect and immune-modulatory effect [1]. These benefits are related to its high content in medium chain fatty acids, in particular lauric acid [2]. However, its biological potential and stability can be affected by high temperatures. This fact is particularly important when its incorporation in food matrices is sought and high temperatures are a key step in such industrial processes. Based on the above considerations, the goal of this work was to evaluate the impact of a heating process (50, 65, 85, 100 and 121ºC during 15 min) on the fatty acids profile of coconut oil and the development of a novel strategy to incorporate coconut oil in dairy matrices ensuring a homogenous matrix. Such strategy includes the development of a microgel for the protection of coconut oil, using carboxymethylcellulose as a gelling agent. The fatty acids profile of coconut oil submitted to sterilization temperature of 121 ºC was evaluated by GC-FID, and a decrease in lauric acid content was observed. The application of the protective microgel led to a preservation of the characteristic profile of coconut oil. Hence, this novel strategy may be applied in the development of new coconut oil-incorporated dairy matrices where pasteurization/sterilization is required.

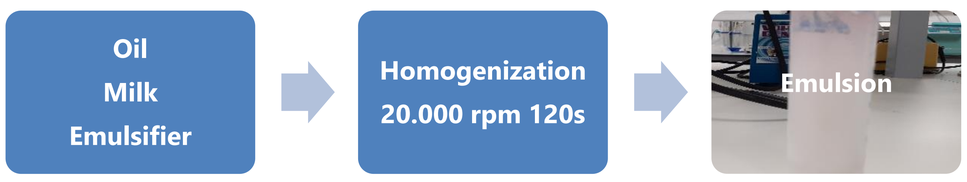
Methods

Oil characterization

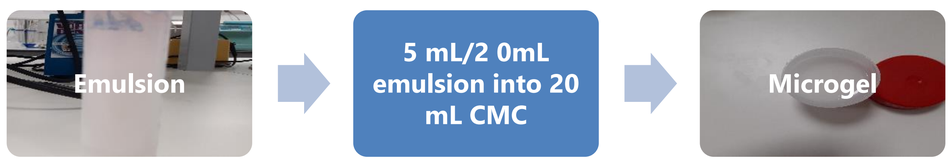


Microgel development

1st Step - Emulsion



2nd Step – Incorporation of the emulsion in carboxymethylcellulose

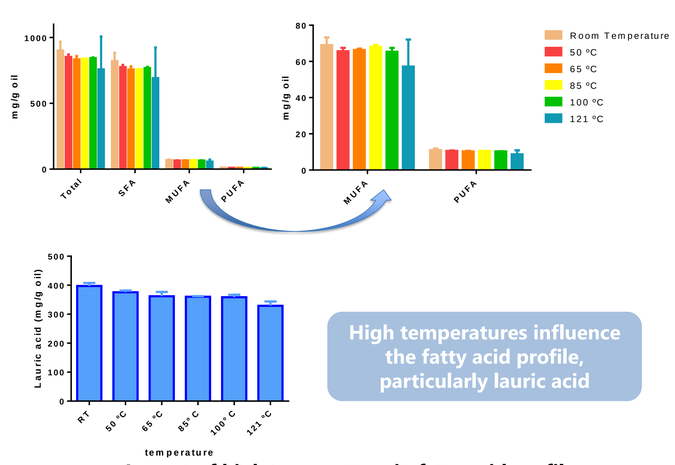


3rd Step – Microgel preliminary characterization

Results

Coconut oil fatty acids profile

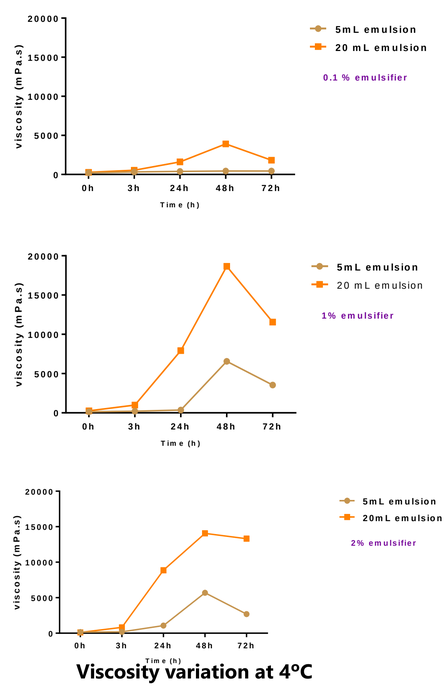
Fatty Acid	Mean	SD
C6	2.3	0.2
C8	40.0	3.9
C10	40.7	3.6
C10:1	0.2	0.02
C12	397.2	10.5
C14	190.8	12.9
C16	106.8	6.6
C18	41.8	2.5
C18:1 *c*9	67.6	4.2
C18:2 *c*9*c*12	11.0	0.8
C20	1.4	0.1
C20:1 *c*7	0.5	0.06
Total mg/g	901.0	66.4
SFA mg/g	820.9	61.4
MUFA mg/g	69.0	4.2
PUFA mg/g	11.0	0.8



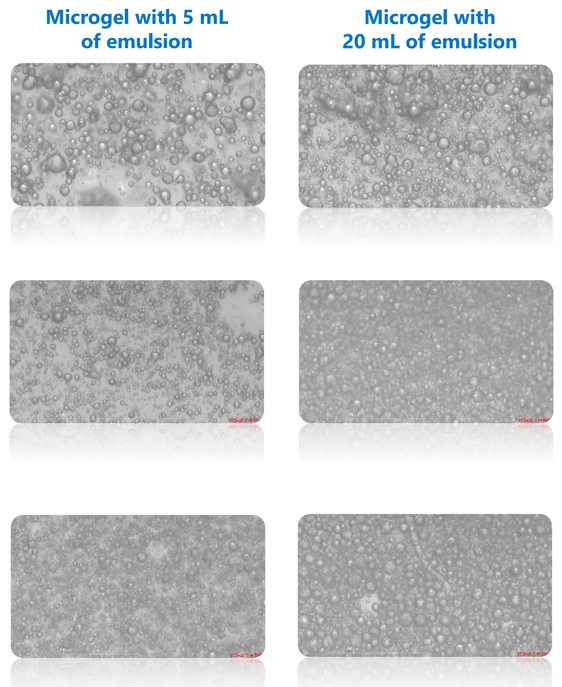
High temperatures influence the fatty acid profile, particularly lauric acid

Impact of high temperature in fatty acid profile

Microgel characterization



Viscosity variation at 4ºC



Inverted microscope images of microgel at T0 h

Conclusions

The fatty acid profile of coconut oil was influenced by the heating treatments. As temperature increases a decrease in lauric acid, the most important fatty acid in coconut oil, was observed.

The microgel formulated with 1% emulsifier seems to be the best option in terms of viscosity and particle size.

Viscosity increases at refrigeration temperature; this observation is important for the development of new products to be storage at 4 ºC.

References
[1] Lockyer, S.; Stanner, S. Coconut Oil – a Nutty Idea ? 2016, 42–54.
[2] Spritzler, F. The Properties of Lauric Acid and Their Significance in Coconut Oil. J. Am. Oil Chem. Soc. 2016, 92 (1), 1–15.

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