Uniwersytet Wrocławski

Repozytorium

Plik pochodzi z repozytorium Wydziału Chemii Uniwersytetu Wrocławskiego

# Water mobility and microstructure of acidified milk model gels with added whey protein ingredients.

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Rok wydania

2022

Czasopismo

Food Hydrocolloids

Numer woluminu

127

Strony

107548/1-107548/13

DOI

10.1016/j.foodhyd.2022.107548

Kolekcja

Naukowa

Język

Angielski

Streszczenie

Water mobility was assessed in acidified milk model systems made from casein and whey protein ingredients using low-field nuclear magnetic resonance (LF-NMR). Two water pools, less mobile and mobile water, were detected during acidification, while three water pools were observed in the resultant stirred acidified milk systems during storage, including a free water fraction of expelled serum (i.e., spontaneous syneresis). The system with highest content of micro-particulated whey protein (MWP) contained a smaller amount of less mobile water at the end of acidification, whereas its stirred acidified gel showed a higher proportion of less mobile water. In addition, it also displayed a higher spontaneous syneresis, induced syneresis and instability index, and lower water-holding capacity (WHC) with a more open and coarse gel structure compared to other systems. The system with highest content of nano-particulated whey protein (NWP) showed a gel structure with larger aggregates, and its water mobility was only slightly affected by structural rearrangements after stirring, resulting in more mobile water in the stirred acidified gel. Compared to NWP, systems with whey protein concentrate (WPC) showed similar spontaneous syneresis and WHC, but lower induced syneresis with a more homogeneous and denser gel structure. Quantitative image analysis of confocal laser scanning microscopy (CLSM) micrographs showed that values of gel particle size (ξ), inter-pore distance (λ), fractal dimension ($D_f$), normalized variation ($\sigma^2$) and pore ratio ($P_a$) can be correlated to water mobility.

Słowa kluczowe

Acidified milk, Gel microstructure, Image analysis, Mobile water, Free wate, Syneresis

Typ publikacji

Artykuł

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Adres publiczny

http://dx.doi.org/10.1016/j.foodhyd.2022.107548

Strona internetowa wydawcy

http://www.elsevier.com

Plik został wygenerowany dnia 2026-11-15 06:08:26

Adres w repozytorium https://old.chem.uni.wroc.pl/pl/repozytorium/3tmEB0S.