Effect of kefiran and milk proteins, sodium caseinates and whey protein concentrates, on the rheological properties and structure of cryogels

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Objective:
?he present work investigates the effect of kefiran concentration and milk proteins on the viscoelastic properties and structure of kefiran cryogels.

Methods:
Kefiran was isolated from kefir grains and cryogels were produced either with no other additives, at kefiran concentrations ranging from 0.5 to 4%(w/w), or with constant kefiran concentration, at 3%(w/w) and the concomitant addition of sodium caseinates and whey protein concentrates at concentrations ranging between 1 to 4%(w/w). For cryogel preparation, the polysaccharide was dissolved in hot water, at 80°C, followed by the addition of milk proteins, when required, and heat treatment at 85°C for 15min. Samples with whey protein concentrates were also prepared without heat treatment. Subsequently, the cryogel formulations were cast in aluminum molds with serrated surface, adapted to the system of the rheometer used, and frozen at -18°C for 24h. Post-freezing, in order to induce cryogel formation, the samples were refrigerated at 4°C for 24h, prior to their rheological evaluation with dynamic analysis and creep-recovery tests at ambient temperature using a DMA rheometer, Bohlin C-VOR 150. The morphology of the cryogels was also examined using a Confocal Laser Scanning Microscope.

Results:
Increasing kefiran concentrations, addition of sodium caseinates and heat-treated whey protein concentrates resulted in increasing the viscoelasticity of the cryogel matrices. Kefiran cryogels display the characteristic cryogel macroporous structure. Low concentrations form more pores, while at higher concentrations the polysaccharide mesh is denser. The presence of casein salts in the system, effected cryogels with a granular texture, while heat treatment only affected the structure of the cryogels with serum protein concentrates, which appeared more open and with large pores in the case of non-denatured proteins.

Conclusions:
Kefiran concentration effects the formation of cryogels with varying density and elasticity matrices. The presence of milk proteins into the system of kefiran cryogels can substantially affect their structure and rheological behavior.

This research was co-financed by Greece and European Union (European Social Fund- ESF) through the Operational Programm «Human Resources Development, Education and Lifelong Learning» in the context of the project “Reinforcement of Postdoctoral Researchers - 2nd Cycle” (MIS-5033021), implemented by the State Scholarships Foundation (???).