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Microalgae Biomass Interaction in Biopolymer Gelled SystemsA.P. Batista¹, M.C. Nunes¹, L. Gouveia², I. Sousa³, A. Raymundo¹, J.M. Franco⁴¹ Núcleo de Investigação em Eng^a Alimentar e Biotecnologia, ISEIT de Almada, Instituto Piaget, 2800-305 Almada (Portugal).² Unidade de Bioenergia, Laboratório Nacional de Energia e Geologia (LNEG), 1649-038 Lisboa (Portugal).³ DAIAT, Instituto Superior de Agronomia, Universidade Técnica de Lisboa, 1349-017 Lisboa (Portugal).⁴ Departamento de Ingeniería Química, Universidad de Huelva, 21071 Huelva (Spain).
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Microalgae are an enormous biological resource, representing one of the most promising sources for new products and applications. They can be used to enhance the nutritional value of food and animal feed, due to their well balanced chemical composition. *Spirulina* (*Arthrospira*) has been used in the human diet for at least 700 years, originally by Native Americans (lake Texcoco, Mexico) and Africans (lake Chad), and nowadays as a dietary food supplement worldwide, due to its balanced composition in proteins, essential fatty acids (e.g. γ -linolenic acid), phycobiliproteins, vitamins (e.g. B12) and minerals [1]. More recently, *Haematococcus pluvialis* has been identified as the organism which can accumulate the highest level of astaxanthin in nature (1.5-3.0% dw) [1]. This carotenoid pigment, primarily used for fish and shrimp pigmentation in aquaculture, was discovered to be an outstanding antioxidant, thus the primary *Haematococcus* production target is currently focused on its potential use as nutraceutical.

But besides colouring and nutritional purposes, introducing microalgal ingredients in food systems, can also impart significant changes in its microstructure and rheological properties, being conditioned by the processing conditions, the nature of the food matrix and the interactions with other food components (e.g. biopolymers).

Recently, pea protein / κ -carrageenan / starch gel systems have been extensively studied as an interesting alternative to dairy desserts [2]. These biopolymer gels served as model systems to study the effect of five different microalgae on the gels rheological behaviour, in a previous work [3]. *Spirulina* and *Haematococcus* gels presented markedly different rheological properties, as compared to the other algae and control gel.

The present goal is to clarify the gelation mechanism of these microalgae and the specific interactions with each biopolymer present in the complex mixed gel system. Hence, the aim of the present work is to study the effect of *Spirulina* and *Haematococcus* microalgal biomass addition on the rheological behaviour of pea protein, κ -carrageenan and starch simple gels.

Biopolymer model systems were prepared using 12% pea protein isolate, 0.75% κ -carrageenan or 5% maize starch. Binary gels were prepared by adding microalgal biomass, in the same proportion to each biopolymer as in the mixed gel, i.e.: 1 g micro-lga for 5.33 g pea protein isolate; 0.20 g κ -carrageenan; 3.33 g starch.

The gelation process was monitored in-situ in a controlled stress rheometer (RS-300, Haake) coupled to an UTC-Peltier system, through dynamic oscillatory measurements (temperature, time and frequency sweep tests), according to previously optimized gel setting conditions for these systems [4-5]. It is intended to compare the gels rheological results to confocal laser scanning microscopy (CLSM) images.

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