Emulgel structured with citrus fiber as potential delivery system of curcumin (*Curcuma longa*) for food application: viscoelasticity modelling, morphology and in vitro diffusion study

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Citrus fiber is recognized to be a structuring ingredient able to form particle hydrogels (in water) or emulgels (oil droplets entrapped in water phase). Emulgels are used in a wide range of food applications such as low-fat and low-calorie foods or food supplements since they are particularly suitable for the delivery of bioactive molecules. In the present work, emulgels containing citrus fiber and potentially suitable as a food supplement of curcumin were produced by high-speed homogenization and using two different edible oils, Miglyol® 812N and rice oil (both at 0.4 w/w). Viscoelasticity of emulgels and of single phases (hydrogels and oil phases) was investigated by frequency sweep test in linear region, previously determined by stress sweep test. Consistency, in terms of complex shear modulus (G*), of both hydrogel and emulgels increased more than linearly with increasing fiber fraction (from 0.020 w/w to 0.030 w/w) whereas structuring degree, in terms of phase angle (δ), was almost independent of the fiber fraction. The addition of curcumin does not affect the viscoelasticity of oil phases based on both oils. Emulgel with rice oil resulted more consistent than that containing Miglyol® 812N, but they showed similar structuring level. Rheological results of emulgels were modelled using the weak gel model. Gel strength increases with increasing fiber fraction; network extension seems independent of fiber concentration. Curcumin does not change the consistency of emulgels, but it slightly decreases structure extension (δ moves from 5.5° to 7.0° approximately). According to in vitro diffusion studies, the diffused curcumin percentage (Cur%) at 24 h was 14.6% for emulgel with Miglyol® 812N whereas for emulgel with rice oil 18.3%. These results can be considered promising to make future investigations attractive.