

Ultrasonically Prepared Water Soluble Curcumin Complexes Preparation and Properties

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Extended Abstract

Curcumin is a major component of the turmeric and is commonly used as a flavouring and colouring agent. Recently it has been found to have antioxidant, anti-inflammatory, antimicrobial and anti-carcinogenic activities and has gained great importance. Curcumin is almost insoluble in water. Haukvik et.al. (2010) had increased the curcumin solubility up to 8.4×10^{-8} M in a phosphate buffer solution containing 10.0% PEG 400.

In this work, PEG-curcumin complexes were prepared by ultrasound at room temperature. Ultrasound had been used for chain scission (Akyuz et al. 2009) and molecular weight of the polymer can be reduced up to a certain limit depending on the power and frequency of the instrument used. At the US power and frequency of the sonication bath used in these experiments (35kHz, 80W) chain scission limit is approximately 100000 ± 20000 and significant molecular weight reduction is not expected for PEG samples. For comparison Curcumin-PEG complexes also prepared by mixing without US. The curcumin solubility was increased up to 0.0027 M depending on the PEG molecular weight and concentration in the complex system. Curcumin-PEG complexes were investigated by viscosity and by zeta-sizer and nano-sizer measurements. In all experiments it is seen that sonicated samples have much narrower zeta potential distributions, indicating that the sonicated samples are much better mixed and are much more homogenous compared to the samples mixed by stirring. Both sonicated and mixed samples were found to be stable at all dilutions in water and sonicated and mixed complexes did not show much difference in terms of curcumin solubility. Critical aggregate concentration (CAC) is determined from both UV data and zeta sizer results. Since PEG is not a charged polymer above this concentration, the potentials of the complexes converged towards zero as CAC was reached. Below CAC, complexes could carry very little amount of curcumin, and above CAC, curcumin concentration increased appreciably. CAC was found to change depending on the molecular weight of PEG. CAC concentrations determined from UV and from zeta sizer measurements differed slightly. They were all around 20-40 percent.

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