

Crystallization Behavior of Phytosterol Solubilized in Oil-in-Water Emulsion

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Functional lipids, such as carotenoids, lipid soluble vitamins, phytosterols, and numerous other substances, are widely used as active ingredients in various food products. However, most of the functional lipids are almost insoluble in water, and poorly absorbed in body. Then, the field of nanoparticle delivery systems for nutrients with poor water solubility has been expanding. When put it to practical use, it is needed to keep a stable solubilization. In this study, we observed crystallization behavior of phytosterol crystals solubilized in O/W emulsion, to observe the effects of the type of emulsifier and emulsion droplet diameter on the inhibition of crystallization in the emulsion droplets.

Phytosterol (3 %) was dissolved in MCT oil phase of O/W emulsion. The water phase included 1 wt% of Tween20 or polyglycerine lauric acid ester (10G1L), which were employed for emulsification. Monodispersed emulsion droplets having the diameter of 10 μm and 30 μm were prepared by a microchannel emulsification technique at 70 °C, then stored at 5 °C. The crystallization in emulsion was observed by optical microscopy during the storage period of 0, 1, 3, 5, 7, 9, 14 days, and the crystallization rate (the number of crystallized droplets divided by the whole number of droplets) was calculated for every storage period. We found that the rate of crystallization varied in accordance with the emulsifier and droplet size. Namely, the crystallization of phytosterol was retarded by using 10G1L and by decreasing emulsion droplet size.