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PREPARATION OF FUCOXANTHIN-MGDG COMPLEXES FOR POTENTIAL PHARMACOLOGICAL APPLICATIONS

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Fucoxanthin is one of many carotenoid pigments found in diatom cells. However, its unique structure and properties make it an interesting compound to study. This xanthophyll pigment exhibits numerous activities that may be used for human advantage, namely in the pharmaceutical and diet supplement industry. Fucoxanthin is a potent antioxidant, able to quench singlet oxygen and scavenge free radicals. Furthermore, it is characterized by the anti-cancer activity, which involves several different mechanisms. Among them are apoptosis induction, arresting cell cycle, metastasis suppression, and overall decrease in cancer cell viability and proliferation. Other beneficial properties of this pigment include antidiabetic and anti-photoaging activities.

Monogalactosyldiacylglycerol (MGDG) is a key lipid components of plant chloroplast membranes. It is characterized by its ability to readily form lipid reverse hexagonal phase and to facilitate membrane fusion.

The scope of fucoxanthin's beneficial actions is hindered by its insignificant water solubility. This pigment which contain a long hydrophobic fragment and thus do not dissolve in water. This issue may decrease the pharmaceutical significance of using fucoxanthin alone as an active agent in human and *in vitro* studies.

To address this problem, we tested if MGDG may be used in complexes with fucoxanthin to decrease the aggregation of pigment molecules in water-based systems. We prepared a series of samples containing fucoxanthin in water-based DMEM medium, used in *in vitro* studies involving human cells, containing 5% ethanol and MGDG in different concentrations. Ethanol was used to ease the initial dissolution of fucoxanthin molecules. We then measured the spectra of those samples and compared the obtained results (maxima ratios and positions) to those of fucoxanthin dissolved in 100% ethanol.

Increasing MGDG:fucoxanthin molar ratio lead to the improvement of pigment's spectral characteristics, as they were closer to those recorded for completely dissolved fucoxanthin. However, above the ratio value of 16.7:1, the spectral characteristics began to worsen again and resembled those of aggregated fucoxanthin above the ratio of 25:1. Moreover, we observed the drift in the location of absorbance maxima and the changes in distance between them. Around the ratio value of 15:1 the distance between the peaks resembled that of dissolved fucoxanthin.

We conclude that the complexation of fucoxanthin with MGDG at the molar lipid:pigment ratio of 15:1 is enough to counteract the aggregation of fucoxanthin in water-based mediums. In the future, this finding may be used to prepare novel formulations for *in vitro* pharmacological tests involving human cell lines.

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