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# Optimization and Characterization of Curcumin Microemulsion Formulations with Aromatic Turmerone-rich Extract

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## Extended Abstract

Incorporation of nano drug delivery systems with plant-derived phytochemicals is a promising research area that provides the possibility of obtaining high efficacy with a low dose of natural therapeutics. Phytochemicals present the best pharmacological action in their ideal form which is their natural complex in the plant. When the component is isolated, its properties such as bioavailability, skin permeability, and stability decrease. Therefore, it will be the most effective approach to use each component in its natural form, together with other bioactives in the plant.

Curcumin (Cur) is the main therapeutic component of Curcuma longa L. which is accepted as an efficient phytochemical for its variety of therapeutic activities. As a hydrophobic polyphenol Cur exhibits antioxidant, antimicrobial, anti-inflammatory, antirheumatic, immunomodulatory, and anti-tumor effects[1, 2].

Aromatic Turmerone (ar-Tur) is the main constituent of turmeric essential oil [3]. It shows anti-inflammatory, anti-oxidant, anti-tumor, and anti-nociceptive activities [4, 5]. Cur coexists with ar-Tur in the rhizome of Curcuma longa L.. Therefore ar-Tur was included in Cur microemulsions to imitate the partially natural environment of Cur in the plant. This approach can result in higher therapeutic efficacy with a low dose or higher drug content of Cur in formulations. In previous studies, it was shown that together with ar-Tur absorption of Cur was significantly higher than Cur without Turmerones in vitro [6].

In this aspect, it was planned to prepare Cur microemulsions with the sesquiterpene fraction of Curcuma longa L. which contains ar-Tur. Plant material was extracted at room temperature to obtain an extract rich in sesquiterpenoid compounds. A petroleum ether (P.E.) extract of turmeric was obtained to remove the polar and phenolic seconder metabolites along with the chlorophyll derivatives. After this process extracts were filtered, followed by rotary evaporation with reduced pressure without heating to concentrate the extract.

In the present study, Cur and ar-Tur loaded microemulsion formulations were prepared to increase the Cur loading capacity, release and also stability. The phase titration method had been chosen as microemulsion preparation to prevent the use of high levels of surfactants. For the optimization of microemulsion formulations, selected independent variables were the amounts of Peceol as used lipid and Transcutol P and Labrasol as used surfactants. Different amounts of Cur and ar-Tur-loaded formulations were prepared. Then, the formulations were characterized by keeping the amount of Cur constant and changing the amount of lipid and surfactants. According to the results of the optimization studies, the particle size was found to be between 104,6 and 284,9 nm, PDI values between 0,045 and 0,361. In order to determine the loss of Cur that may be seen during the preparation of the microemulsion formulations, the drug content in the microemulsion formulations was determined. As a result of the studies, it was determined that the Cur was recovered from the microemulsion formulations at a high rate.

The study showed that the ar-Tur significantly increased the Cur loading capacity in Cur-ar-Tur microemulsions compared to Cur formulations alone. As a result, optimized Cur-ar-Tur microemulsion formulation could be offered as a promising strategy for topical application regarding their high drug content, PDI and particle size. In further studies characterization related to optimization, in vitro release, and physical stability tests will be performed.

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