Preparation of liposomes encapsulating curcumin using supercritical carbon dioxide with ultrasonication

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Curcumin is a diarylheptane, a natural phenol that causes turmeric to appear yellow. Studies have shown that curcumin has a variety of biological activities, including anti-inflammatory, anti-bacterial, and anti-cancer. It can be used in many diversity applications such as food and medical industries. However, curcumin is unstable and has poor bioavailability. Because it is insoluble in water, it is difficult to be absorbed and utilized by the human body.

Liposomes are spherical vesicles composed of one or more phospholipid bilayers surrounding discrete aqueous compartments. They are often used as drug carriers, so, curcumin can be encapsulated in liposomes to improve aqueous dispersion and prevent oxidation with higher bioavailability.

Non-toxic, non-polluting supercritical carbon dioxide (SC-CO_2) is an alternative to organic solvents in conventional methods when preparing liposomes. It can be easily separated from products and it is suitable for processing and encapsulating thermally unstable substances, because of its low critical temperature.

In this study, an SC-CO_2/water mixture was used as a solvent to produce organic-solvent-free liposomes and ultrasonication was used as stirring power to promote liposome formation. We investigated the effects of temperature (40-70 ℃, pressure (10-25 MPa) and ultrasonic frequency (28-100 KHz) on the encapsulation efficiency of liposomes and the particle size and stability of the products. We also investigated how the encapsulation efficiency varies with the number of days (0-30 days) when the liposomes were stored at different temperature (5 ℃37 ℃.