

# Summary Report: Curcumin – Extraction, Health Benefits, and Delivery Systems

## 1. Overview

Curcumin is the principal curcuminoid found in turmeric (*Curcuma longa*) rhizomes. It has been historically used in traditional medicine for its anti-inflammatory, antioxidant, and antimicrobial properties. However, due to its low water solubility and poor bioavailability, advanced extraction and delivery methods are required for effective use.

## 2. Extraction Methods

Extraction techniques for curcumin range from conventional solvent extraction to advanced methods such as:

- Ultrasound-Assisted Extraction (UAE)
- Microwave-Assisted Extraction (MAE)
- Enzyme-Assisted Extraction (EAE)
- Supercritical Fluid Extraction (SFE)
- Pressurized Liquid Extraction (PLE)

Advanced methods typically offer higher yields and are more environmentally friendly.

## 3. Health Benefits of Curcumin

Scientific evidence supports curcumin's efficacy in treating or preventing:

- Oxidative stress (antioxidant effects)
- Bacterial infections (antibacterial)
- Depression (neurotransmitter regulation)
- Diabetes (glucose regulation)
- Cancer (inhibition of cell proliferation)

## 4. Delivery via Microemulsions & Nanoemulsions

To enhance curcumin bioavailability, microemulsion and nanoemulsion systems are used. These encapsulate curcumin in oil-water mixtures stabilized by surfactants. Nanoemulsions are preferred for their kinetic stability and small droplet size, improving solubility and absorption.

## 5. Practical Applications

- Academic research on natural compounds
- Development of health supplements and functional foods
- Funding proposals and product design for nutraceuticals
- Clean-tech extraction and nanoencapsulation ventures