IIT MADRAS
Indian Institute of Technology Madras

Technology Transfer Office
TTO – IPM Cell

Industrial Consultancy & Sponsored Research (IC&SR)

A FORMULATION COMPRISING NANO-SCALE ANTI-CANCER COMPOUND

IITM Technology Available for Licensing

PROBLEM STATEMENT

- **Nanotechnology's versatility in cancer medicine** includes easy permeation through blood vessels, **improved therapeutic efficacy, prolonged half-life**, controlled release, improved bioavailability, enhanced site specificity, reduced dosage concentration, and less or no toxic side effects.
- **Studies show the therapeutic potential of polyphenolic components from spices** and their oils, with **potent cytotoxic** and antimicrobial activity.
- A **nano-scaled formulation of Indian celery oil** using a simple microemulsion technique shows potent anticancer activity in human cancer cell lines.
- The ease of **preparation, easy availability, bio-based approach,** and utilization of nanotechnology could lead to a major **breakthrough in cancer treatment** at low-dosage concentrations with limited or no side effects.

TECHNOLOGY CATEGORY/ MARKET

Technology: A formulation comprising nano-scale anti-cancer compound
Category: Drugs & Pharmaceutical Engineering
Industry: Pharmaceutical industry
Application: Anticancer
Market: The global market size was valued at **USD 1482.0 billion in 2022** and is **expected to grow at a CAGR of 6.12%** from **2023 to 2030**.

INTELLECTUAL PROPERTY

IITM IDF Ref. 1424
Patent No: IN 493315

TRL (Technology Readiness Level)

TRL- 3 Experimental proof of concept

Research Lab

Prof. Nagarajan R,
Dept. of Chemical Engineering

TECHNOLOGY

Method of preparation of a nano-scaled anti-cancer compound

1. .**Indian spice oil (Celery)**: Non-ionic surfactant **(Tween 20) mixture (1:6)**
2. **Water added dropwise** to the mixture at a constant stirring rate of **500 rpm**
3. **Technique involved** is **conventional titration technique** at laboratory conditions
4. **Clear and transparent nano-scaled emulsion** formed spontaneously through self-assembly
5. Demonstrated potent cytotoxicity against colon cancer cell line **(HCT-116 wild type)** through **apoptosis mechanism**
6. **Optimized formulation A6** chosen based on clarity,stability,small droplets in nano range ,low viscosity ,ease to form spontaneously , cost effectiveness and **potent cytotoxic activity against colon cancer cell**

CONTACT US
Dr. Dara Ajay, Head TTO
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
https://ipm.icsr.in/ipm/

Email: headtto-icsr@icsrpis.iitm.ac.in
tto-mktg@icsrpis.iitm.ac.in
Phone: +91-44-2257 9756/ 9719

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FIG. 1 illustrates seed oil of Apium spp formulation using tween 20 as surfactant a) left to right; 1:1 to 1:9 and b) left to right; 1:9 to 9

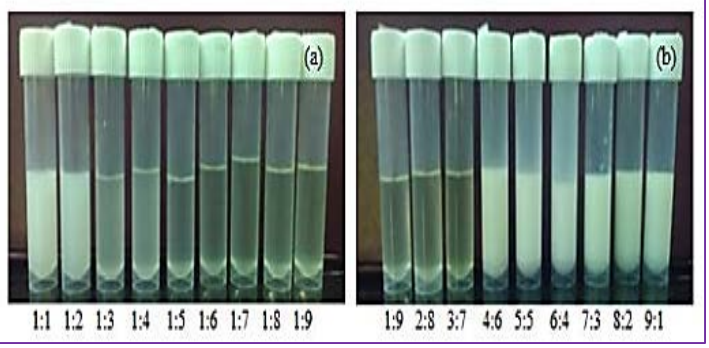
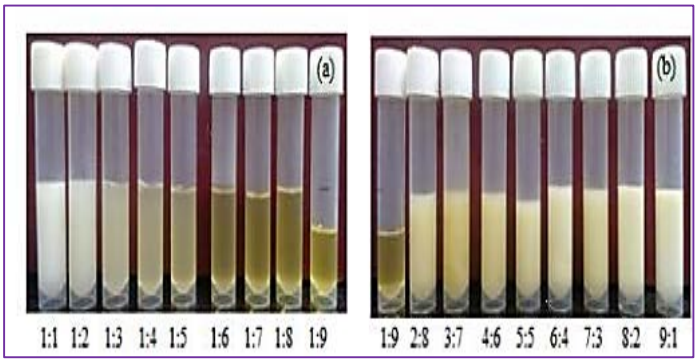


FIG. 3 illustrates seed oil of Apium spp formulation using tween 80 as surfactant a) left to right; 1:1 to 1:9 and b) left to right



Key Features / Value Proposition

Seed Oil Use

- Formulation uses seeds from various Apium species. • Rich in antioxidants, flavonoids, essential fatty acids.
- May have anti-cancer properties by inhibiting tumor growth and promoting cell apoptosis.

Nano-Scale Emulsion Stabilization with Non-Ionic Surfactants

- Tween 20 and Tween 80 stabilize nano-scale emulsion.
- Solubilize hydrophobic Apium seed oils in water.
- Ensures effective delivery of bioactive compounds.

Nano-Scale Emulsion Formation

- Enhances bioavailability and absorption of active compounds.
- Larger surface area facilitates efficient interaction with cancer cells.
- Improves formulation effectiveness.

Simple Preparation Method for Emulsion

- Mixing Apium seed oil with non-ionic surfactant.
- Dropwise adding organic phase to water.
- Stirring mixture at 400-600 rpm with magnetic stirrer.
- Allows spontaneous nano-scale emulsion formation.

Final Emulsion Transparency

- Indicates stable dispersion of oil droplets at nano-level.
- Suggests small particle size, ideal for stable, bioactive delivery system.

Seed Oil Concentration in Formulation

- Uses Apium spp. seed oil at 4-6% v/v.
- Optimized for therapeutic effect and nano-emulsion stability.

Organic Phase Composition Flexibility

- Allows mixing of Apium seed oil and non-ionic surfactant.
- Optimizes formulation for anti-cancer activity.
- Emulsion selection based on transparency.

Applications of the Nano-Scale Anti-Cancer Compound Formulation:

- **Topical Application for Skin Cancer:**
- **Systemic Cancer Treatment:**
- **Enhanced Bioavailability for Cancer Therapy:**
- **Drug Delivery Platform:**
- **Combination Therapy:**
- **Cancer Prevention:**
- **Cosmetic Anti-Cancer Applications**

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tto-mktg@icsrpis.iitm.ac.in
Phone: +91-44-2257 9756/ 9719