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# Nanoencapsulation of Eugenol in Advanced Drug Delivery System

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**ABSTRACT:**
Eugenol is a phytogenic bioactive component which has numerous beneficial aspects against many threatening indispositions including oxidative stress, inflammation, hyperglycemia, elevated cholesterol level, neural disorders, fighting against microbes and cancer. Nanoencapsulation can incorporated to most of the drugs which are poorly water soluble, can be administered through any route and is less irritable with high absorption ratio. Considering the benefits of eugenol and nanopaticles in drug delivery system, the attempt of converting nanoeugenol was made for successful in-corporattion of nanoeugenol in medicinal practices for various uses. Encapsulation of Oil in water emulsion was done by mixing Eugenol and Tween 80 were mixed at 1:1 ratio and water was added slowly to get desired concentration. High-energy method i.e, ultrasonication that causes intense mechanical forces was used to break up droplets into smaller droplets to get uniform suspension without phase separation using ultrasonicator. The resultant suspension of Nanoeugenol was turbid white in colour which was easily soluble in water for further dilutions of desired concentrations. The Z-average of eugenol particles was found to be 97.65 nm and the resultant nanoeugenol was found to be 7.27 nm. Considering the advantages of the nanoparticles in the durg delivery system, it can used as a very good antioxidant, anti-inflammatory, antimutagenic, antimicrobial, antiviral and anticancer drug.

## I. INTRODUCTION:

Eugenol is a phytogenic bioactive component is frequently found in diversified herbal plants like clove, cinnamon, tulsi and pepper. Chemical name of eugenol is 4-Allyl-2-methoxyphenol with chemical formula C10H12O2. Eugenol has numerous beneficial aspects against many threatening indispositions including oxidative stress, inflammation, hyperglycemia, elevated cholesterol level, neural disorders, fighting against microbes and cancer. The main principle mechanistic approaches associated with the therapeutic potential of eugenol include its free radical scavenging activity, hindrance of reactive oxygen species' generation, preventing the production of reactive nitrogen species, enhancement of cyto-antioxidant potential and disruption of microbial DNA & proteins. Eugenol has anti-inflammatory and chemopreventive effects, as well as its superior anti-oxidant activity due the presence of its phenolic group. Encapsulation of bioactive compounds represents a feasible and efficient approach to modulate drug release, increase the physical stability of the active substances, protect them from the interactions with the environment, decrease their volatility, enhance their bioactivity, solubility, reduce toxicity, and improve patient compliance and convenience. Nanoencapsulation can incorporated to most of the drugs which are poorly water soluble, can be administered through any route and is less irritable with high absorption ratio. Considering the benefits of eugenol and nanopaticles in drug delivery system, the attempt of converting nanoeugenol was made for successful in-corporation of nanoeugenol in medicinal practices for various uses.

## II. MATERIALS AND METHOD:

Technical grade Eugenol was procured from Sigma Aldrich with CAS No. and purity. Non-ionic surfactant Tween 80 was procured from CDH. Encapsulation of Oil in water emulsion was done by the following procedures. Eugenol and Tween 80 were mixed at 1:1 ratio and water was added slowly to get desired concentration. High-energy method that causes intense mechanical forces was used to break up droplets into smaller droplets. The ultrasonicator was used for the purpose until the suspension was uniform without phase separation.

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**Protocol:**

1. 1 ml of Eugenol and 1ml of Tween-80 was taken in the beaker (1:1) and mixed well to form a homogenized mixture.
2. Distilled water at $37^0$C is added slowly and stirred to form a solution of desired concentration.
3. The resultant solution was subjected to ultrasonication in ultrasonitor homogenizer (MLI,Germany) at 470W ( 227-228 V, 0.63 amps) for 10 minutes.
4. The procedure was repeated 4 times (in order to avoid excess heating of the compound) to get finer nanoparticles of eugenol which were very stable.
5. The resultant suspension of nanoeugenol was analyzed for the particle size using Zeta-sizer.

## III. RESULTS AND DISCUSSION:

The nanoeugenol was dissolved with solvent Tween 80 in 1:1 ratio and dispersed in the aqueous phase (sterile distilled water) (10% solution). The resultant suspension of Nanoeugenol was turbid white in colour. The resultant suspension could be easily soluble in water for further dilutions of desired concentrations. The particle size was analyzed by particle size analyzer (Zeta Sizer). The Z-average of eugenol particles was found to be 97.65 nm and the resultant nanoeugenol was found to be 7.27 nm. The resultant had better water solubility and good stability of the solution. Considering the advantages of the nanoparticles in the durg delivery system, it can used as a very good antioxidant, anti-inflammatory, antimutagenic, antimicrobial, antiviral and anticancer drug.

**Fig No. 1** Solution prepared from Nanoeugenol

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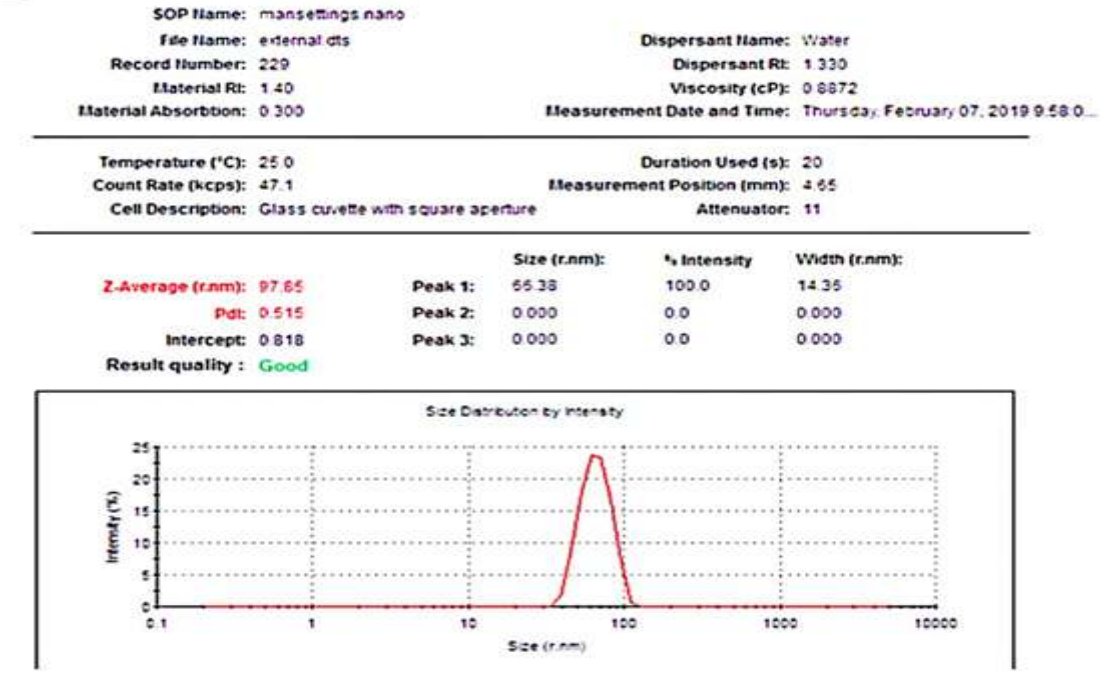
**Fig No. 2 :** Z-average of Eugenol obtained from Zetasizer



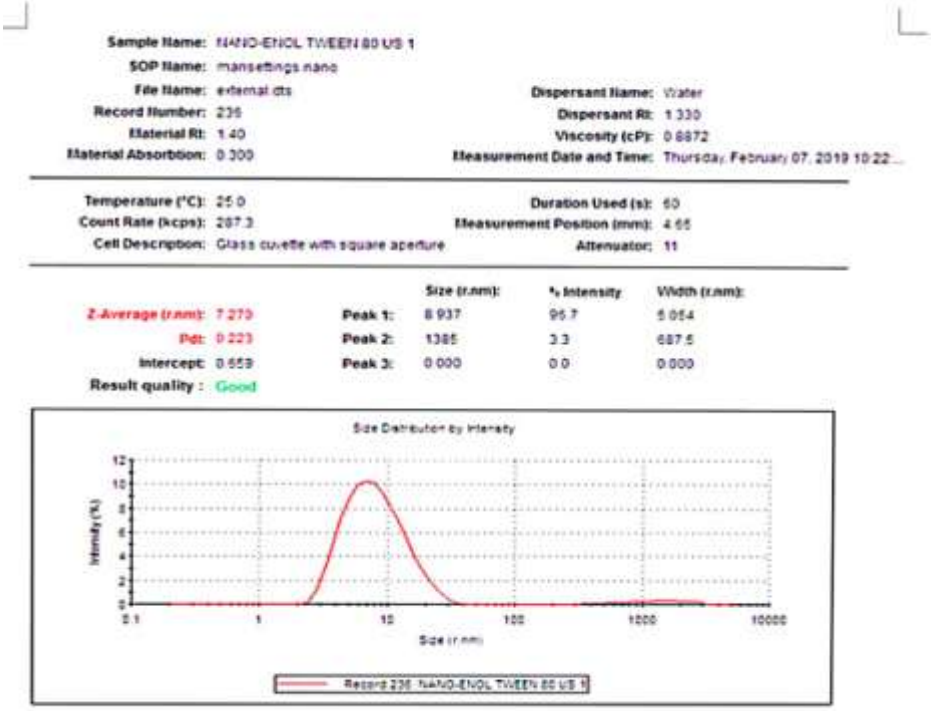




**Fig No. 3 :** Z-average of Nanoeugenol obtained from Zetasizer

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