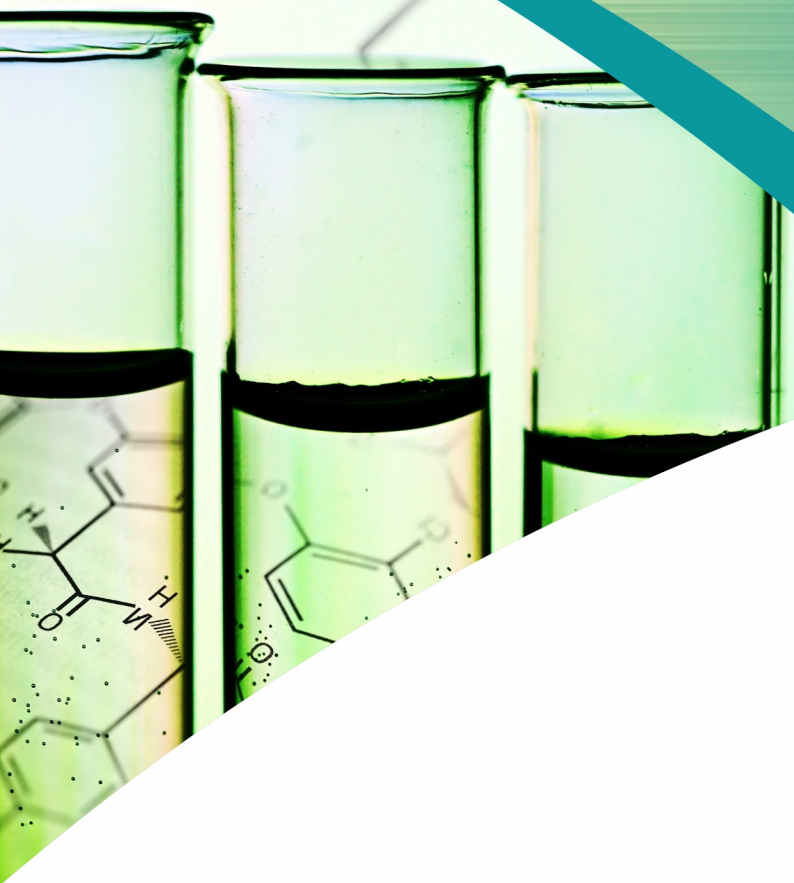


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School of Pharmaceutical Sciences & Research

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Development of Nanoemulsion Formulation of Essential Oil Extracted from *Zanthoxylum Armatum* D.C for the Management of Arthritis

Saima Amin, Rajesh Kumar Chaudhary, Kanchan Kohli and Showkat R Mir
Department of Pharmaceutics, SPER, Jamia Hamdard, New Delhi 110062

ABSTRACT

Background and Aim: Synthetic drugs used for the management of arthritis have higher side effects and cost. Therefore, there is a need for the search of alternative and complementary herbal medicines which are safe, effective, having minimal side effects and relatively of low cost. *Zanthoxylum armatum* D.C. (Family: Rutaceae) is one of the most important valuable medicinal plants reported in Ayurvedic pharmacopeia of India. Traditionally it's used in the management of arthritis in Nepal but has poor bioavailability due to its low aqueous solubility. Therefore, the aim of our research was to develop a palatable nanoemulsion formulation to increase its aqueous solubility and hence the bioavailability.

Methods: The essential oil from the fruits of *Zanthoxylum armatum* D.C. was extracted using a modified Clevenger type apparatus through hydro-steam distillation method. The extracted essential oil was identified by GCMS to confirm the presence of various chemical constituents in the essential oil. Capryol 90, Tween 80 and Transcutol-P as oil, surfactant and co-surfactant were used to formulate nanoemulsion using aqueous titration method.

Results: The extracted oil showed the presence of 29 components through GCMS analysis. The essential oil was formulated as nanoemulsion using Smix (1:1) and oil: Smix ratio 1:4. The formulation showed high zeta potential, small droplet size and high transmittance. The cumulative drug release of the nanoemulsion in phosphate buffer pH 6.8, was 75.3 % while plain essential oil showed 10.4 % in 6 h. *Ex-vivo* drug absorption study over a period of 1.5h showed that nanoemulsion formulation permeated substantially higher (2.3459 $\mu\text{l}/\text{cm}^2$ through the small intestine as compared to plain essential oil (1.54 $\mu\text{l}/\text{cm}^2$) in non-everted gut sac method. In everted gut sac method, the cumulative amount of essential oil permeated was 53.2591 $\mu\text{l}/\text{ml}$ than the plain essential oil 22.2279 $\mu\text{l}/\text{ml}$. The confocal laser scanning microscopy revealed greater penetration (i.e. 54.9 μm) of nanoemulsion through the small intestine as compared to plain essential oil (i.e. 25 μm). High, medium and low doses of nanoemulsion formulation revealed efficacy in arthritic Wistar rat (Fig.1).

Conclusion: *Zanthoxylum armatum* D.C essential oil loaded nanoemulsion showed better absorption and greater penetration through the small intestine. The *in-vivo* performance of the formulation was safe and effective in the management of arthritis.

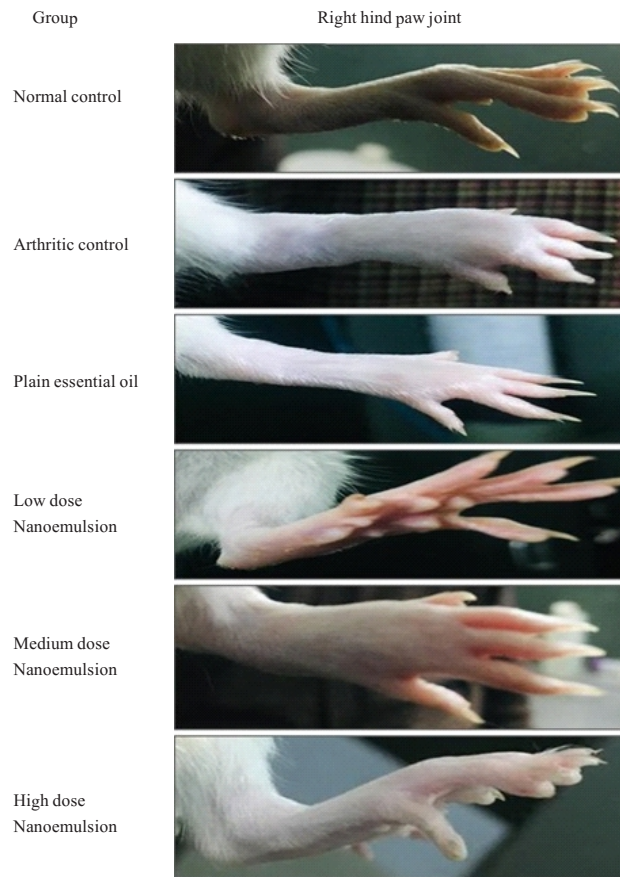


Fig. 1: Effect of essential oil containing nanoemulsion in the treatment of arthritis



Aims & Scope

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