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Synergistic Studies of Liposomes of Clove and Cinnamon Oil in Oral Health Care

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Abstract : Despite great improvements in health care, the world oral health report states that dental problems still persist, particularly among underprivileged groups in both developing and developed countries. Dental caries and periodontal diseases are identified as the most important oral health problems globally. Acidic foods and beverages can affect natural teeth, and chronic exposure often leads to the development of dental erosion, abrasion, and decay. In recent years, there has been an increased interest toward essential oils. These are secondary metabolites and possess antibacterial, antifungal and antioxidant properties. Essential oils are volatile and chemically unstable in the presence of air, light, moisture and high temperature. Hence many novel methods like a liposomal encapsulation of oils have been introduced to enhance the stability and bioavailability. This research paper focuses on two essential oils, clove and cinnamon oil. Clove oil was obtained from Syzygium aromaticum Linn using clavengers apparatus. It contains eugenol and β caryophyllene. Cinnamon oil, from the barks of Cinnamomum cassia, contains cinnamaldehyde, The objective of the current research was to develop a liposomal carrier system containing clove and cinnamon oil and study their synergistic activity against dental pathogens when formulated as a gel. Methodology: The essential oil were first tested for their antimicrobial activity against dental pathogens, Lactobacillus acidophillus (MTCC No. 10307, MRS broth) and Streptococcus Mutans (MTCC No .890, Brain Heart Infusion agar). The oils were analysed by UV spectroscopy for eugenol and cinnamaldehyde content. Standard eugenol was linear between 5ppm to 25ppm at 282nm and standard cinnamaldehde from 1ppm to 5pmm at 284nm. The concentration of eugenol in clove oil was found to be 62.65 % w/w, and that of cinnamaldehyde was found to be 5.15%s w/w. The oils were then formulated into liposomes. Liposomes were prepared by thin film hydration method using Phospholipid, Cholesterol, and other oils dissolved in a chloroform methanol (3:1) mixture. The organic solvent was evaporated in a rotary evaporator above lipid transition temperature. The film was hydrated with phosphate buffer (pH 5.5).The various batches of liposomes were characterized and compared for their size, loading rate, encapsulation efficiency and morphology. The prepared liposomes when evaluated for entrapment efficiency showed 65% entrapment for clove and 85% for cinnamon oil. They were also tested for their antimicrobial activity against dental pathogens and their synergistic activity studied. Based on the activity and the entrapment efficiency the amount of liposomes required to prepare 1gm of the gel was calculated. The gel was prepared using a simple ointment base and contained 0.56% of cinnamon and clove liposomes. A simultaneous method of analysis for eugenol and cinnamaldehyde.was then developed using HPLC. The prepared gels were then studied for their stability as per ICH guidelines. Conclusion: It was found that liposomes exhibited spherical shaped vesicles and protected the essential oil from degradation. Liposomes, therefore, constitute a suitable system for encapsulation of volatile, unstable essential oil constituents.

Keywords : cinnamon oil, clove oil, dental caries, liposomes
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