

## Preface

Cashew nutshell (CNS) is a by-product produced after processing of cashew nuts obtained from the plant *Anacardium occidentale* (family: *Anacardiaceae*). Cashew nutshell contains greenish-yellow liquid entrapped inside the soft honeycomb-like structure of the shell which is popularly known as cashew nut shell liquid (CNSL). CNSL is an extraordinary source of natural polyphenols constituting about 30-35% of the cashew nutshell weight. CNSL primarily contains three major constituents viz. Cardol (15-20%), Cardanol (10%) and Anacardic Acid (60-65%). Anacardic Acid has been proved for its wide pharmacological activities, including antimicrobial, antifungal, antimalarial, anticancer, antiphotaging, anti-inflammatory, and antioxidant activities. The antimicrobial activity of Anacardic acid is due to salicylic acid moiety whereas the alkyl side chain contributes to variation in the activities of different forms ( $C_{15.0}$  -  $C_{15.3}$ ). Maximum antimicrobial activity against *Staphylococcus aureus* has been reported for  $C_{15.3}$  while the activity is least with  $C_{15.0}$ . Anacardic Acid has also been proved to inhibit *Staphylococcus aureus* biofilms by inhibiting quorum sensing. Anacardic Acid ( $C_{15.0}$ ), has been reported to suppress the p300 HAT enzyme which plays a key role in UV-B radiation mediated skin photoaging. It has also been reported to inhibit MMP-1 gene transcription as well as histone modification in the human dermal fibroblasts. The antioxidant potential of Anacardic Acid may also play a role against photoaging by reducing the reactive oxygen species (ROS) production. Although Anacardic Acid has been found to have a diverse range of pharmacological activities yet, its therapeutic potential is limited due to physicochemical characteristics like poor aqueous solubility, vesicant nature, short half-life and thereby limited bioavailability.

The goal of the research work was to improve solubility, physicochemical characteristics of Anardic Acid and thereby enhance the pharmacological activity of Anacardic Acid. The study was designed to improve the anti-biofilm and anti-photoaging activities of Anacardic Acid. Two different formulation approaches were employed to improve anti-biofilm potential, the first approach was intended to develop an inclusion complex of Anacardic Acid and the second involved preparation of chitosan and DNase coated solid lipid nanoparticles (SLNs). Further, HP- $\beta$ -CDnanospongebased gel was developed to enhance the healing potential of photoaged skin. The formulation was developed successfully after the screening of excipients and optimization of various parameters. Finally, the formulation was evaluated for the respective pharmacological activities.

The overall purpose of the research was to provide exhaustive concepts to the readers about various pharmacological activities and physicochemical properties of Anacardic Acid. Further, the philosophy of the research was to provide insights into the Anacardic Acid encapsulated formulations and their potential in combating biofilms and skin photoaging.