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RESEARCH ARTICLE

Casuarina equisetifolia Extract Loaded Phytosomes: Optimization, Characterization and *In vivo* Evaluation of Antidiabetic and Antihyperlipidemic Activities in Wistar Rats

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Abstract: ***Background:*** Herbal extracts have brilliant *in-vitro* activity but less *in-vivo* action in light of their macromolecular size and poor lipid solubility bringing about poor absorption and low bioavailability. These issues can be corrected by designing novel drug delivery systems. Phytosomes provide better absorption and bioavailability when compared to conventional herbal extract.

Objective: This paper deals with the preparation, optimization and characterization of Phytosome of plant extract and *in vivo* assessment of antidiabetic and antihyperlipidemic activity for improved therapeutic efficacy having sufficient stability.

Methods: Preliminary distinctive strategies were utilized to get ready Phytosome and antisolvent precipitation method was chosen. The formulation was guided by a full factorial design to study the effect of Independent variable on various dependent variables and resulted in an optimised product. Response contour plots were generated for each response factor to predict a phytosomal composition that yields phytosome formulation having least particle size and maximum entrapment efficiency.

Results: Mean particle size, entrapment efficiency and Span value were found to be 295 ± 0.53nm, 82.43 ± 1.65% and 0.34 ± 0.14 respectively. Zeta potential was found to be 19.35mv, indicating the formation of stable formulation. *In vitro* release study described that the drug release follows the Korsmeyer-Peppas kinetic model. The results proved that Phytosomes of *Casuarina equisetifolia* extract exhibited more antidiabetic potential and antihyperlipidemic properties as compared to crude *Casuarina* extract.

Conclusion: Phytosomes of *Casuarina equisetifolia* extract was successfully formulated having good entrapment efficiency and physico-chemical characterization of the optimized product, confirming the formation of stable formulation. *In vivo* antidiabetic activity confirmed better potential of the optimised formulation. Consequently, it has been presumed that Phytosomes of *Casuarina equisetifolia* extract serve as a useful novel drug delivery system and provide more therapeutic efficacy than conventional plant extracts.

ARTICLE HISTORY

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Keywords: Phytosomes, soya lecithin, cholesterol, factorial design, contour plot, entrapment efficiency.

1. INTRODUCTION

Phytosome is an innovation in which standardised plant extracts or polyphenols (like flavonoids, terpenoids and tannin and so forth) are made to respond with phospholipids to frame a lipid complex. Phytosomes are a sub-atomic relationship in which a half and half bond arrangement happens between Phosphatidylcholine (PC) and polyphenol, making an exceptionally lipid miscible complex for improvement of molecular size, having the capacity to cross the organic film, and subsequently enhancing the bioavailability of polyphenols. This approach can be used for targeted delivery of herbal medicine as well as for therapeutic purposes like cancer and health purposes as diabetes, inflammation etc. The numerous studies *i.e.* Phytosomal preparation of *Aegle marmelos* [1], Ashwagandha [2] *Clerodendron paniculatum* root extract [3], Marsupsin [4], Quercitin [5], Silymarin [6], Rutin [7], Curcumin [8], apigenin [9], Boswellic acid [10], Berberine [11], Sinigrin [12], Luteolin [13] and Diosmin [14] have proved that this phospholipid aggregated formulation strategy is highly beneficial for delivery of phytoconstituent and also for the bioavailability enhancement.

The plant *Casuarina equisetifolia* Forst belongs to the family *Casuarinaceae*. It is a widespread seashore tree

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