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RESEARCH ARTICLE

Formulation and Characterisation of Nanosuspension of Plant Extract *Cocculus Pendulus*

Sampath Kumar Ramala*, G. Alagumanivasagam

Department of Pharmacy, Annamalai University, Chidambaram, Tamil Nadu, India.

Abstract

Nanotechnology is a promising technique to increase the bioavailability of herbal medicines. The present study was formulated to evaluate nanoparticles using an ethanolic extract of *Cocculus pendulus*. The sonoprecipitation technique was employed for the preparation of nanosuspensions with poloxamer-407 and PVA with many trails and finally the optimized nanosuspension demonstrated a mean particle size, polydispersity index, and zeta potential of 536 nm, 0.256, and − 17.6 mV, respectively. The results of the characterization studies illustrated that the nanosuspension was in the nanometer size range and spherical in shape had good surface morphology. The present outcomes clearly demonstrated that to obtain an effective therapeutic potential, nanoformulation of medicinal plants is a better alternative than conventional dosage forms.

Keywords:*Nanosuspension, sonoprecipitation, Mean particle size, Polydispersity index, And zeta potential.*

Introduction

The plant *Cocculus pendulus* (synonym: *Cocculus leaeba*) is a woody climbers and scandent shrub which is commencing unusually in efficient areas, along rocks and in the dry mountainous areas of Venkatadri and Seshadri hills of Chittoor district in Andhra Pradesh this species dispersed in subtropical and tropical countries all over the world to treat discrete abnormalities [1]. The plants of genus Cocculus are pre-owned for the remedy of fractures, skin diseases, poisonous bites, tubercular glands, gout, burning sensation, leprosy, colic, cough, bronchitis, hypertension and general prostration.

The roots are intermittently used in the therapy as a tonic and intermittent fevers. A few anticancer, hypotensive activity has also been accompanied with the alkaloidal fractions of the stems and leaves [2].Nanotechnology wants to control the smallest structures built of atoms and molecules. It is connected with colloidal chemistry and physics, biology, medicine, pharmacy and engineering (materials and processes) [3]. It is an optimistic perspective of the 21st century and delightful area of research related to production of nanoparticles of flexible shape and size, in inclusion to their potential interest in clinical medicines. It is on doorstep of providing an entertainer of innovative commodity and approaches in rationalizing the therapeutic and pharmaceutical field. In present aeon, it remarkably assists the formation of biological medicine and bioavailability enrichment of phytomedicines [4].Nanonisation of herbal drugs is opening the modern span of herbal drug discovery and it has many utilites, such as hike the compound solubility, condensing medicinal doses and enhances the absorbency of herbal medicines contrast with the relevant crude drugs preparations [5].

Nanosuspensions have been extensively used to dispense with the dilemma accompanying with poor dissolution properties and inconsistent bioavailability. Nanoparticles with size stretch from 200 to 500 nm improvement the dissolution rate, saturation solubility and apparently the mucoadhesion of drug which adequacy further progress the oral bioavailability [6].

Materials and Method

Cocculus pendulus plant obtained from Botanical garden voucher no.1122 in Sri Venkatasewara University, Tirupathi, Andhra Pradesh.

Polysorbate-80 and Polyvinyl Alcohol (PVA) Purchased from Subra Scientific Company Pondicherry, Poloxamer-407 was gift sample from Torrent Pharmaceuticals ltd, Ahmedabad, India. Distilled water was used for this entire study

Preparation of Extract from Crude Plant

The freshly collect the whole plant of Cocculus pendulus was dehydrated by shade dried to remove the moisture content The dried plant was pulverised and made fine powder. The powdered samples are subjected or extracted with three peculiar solvents (Pet.Ether, Ethyl acetate, Hydroalcohol) with succeeding hot continuous percolation in soxhlet apparatus. The extracts were concentrated on a rotary evaporator and furnish to freeze drying in a lyophilizer till dry powder was accomplished [7].

Sonoprecipitated Nanosuspension Preparation

The preparation of Cocculus pendulus nanoparticles was carried out by using Sonoprecipitation method(.R) various optimised condition including selction of surfactants, solvents, solvent:antisovent ratio sonication time and watts. The lyophilised product of plant extract of 1gm was added to 30ml of ethanol and PVA by using magnetic stirrer to get homogenous dispersion. Next, antisolvent 120ml of water with 2gm of poloxamer-407 this was under probe sonicator 200w in 10min to this solution the homogenous solution was injected rapidly through syringe. These solution kept in magnetic stirrer for 1000rpm to solvent evaporation the suspension was centrifuged 10,000 rpm, at 4 °C for 10 min. The centrifuged precipitate was dried out before testing [8].

Characterisation of Nanosuspension

Scanning Electron Microscope

Samples were allowed to air by dropping onto aluminium stubs. Then it is observed uner sem (JOEL, JSM-6360A) by coating the air dried particles with gold in vacuum using a Fiscon Instrument Sc 502 sputter coater which is operated at of voltage of 15 kV[9]

Transmission Electron Microscopy (TEM)

The morphological aspects of optimized nanosuspension were analyzed with the help of transmission electron microscopy (TEM;Morgagni 268D SEI, USA) that was put at 200 kVand at a 0.18-nm resolution. The particle shape and size of the nanosuspension were analyzed by way of combined bright field imaging at escalating magnification and diffraction modes. For TEM examination, an appropriately diluted nanosuspension was negatively stained with the dye uranyl acetate, kept on the holey film grid, and analyzed after drying [10].

FT-IR Spectroscopy

Perkin Elmer system 2000 spectrophotometer is used to evaluate the molecular structure of crude extract and nanoparticles by crushing them with KBr pellet.the IR spectra ere scanned from 4000-400 cm^{-1} [11].

Particle Size, Polydispersity Index and Zeta Potential Measurement

Particle size, polydispersity index and zeta potential were determined by dynamic light scattering technique using Malvern Zetasizer (Malvern Instruments, UK),and zeta potential was also measured using zeta sizer which uses a combination of laser doppler velocimetry and phase analysis light scaterring techniques [12].

Results and Discussion

Scanning Electron Microscope

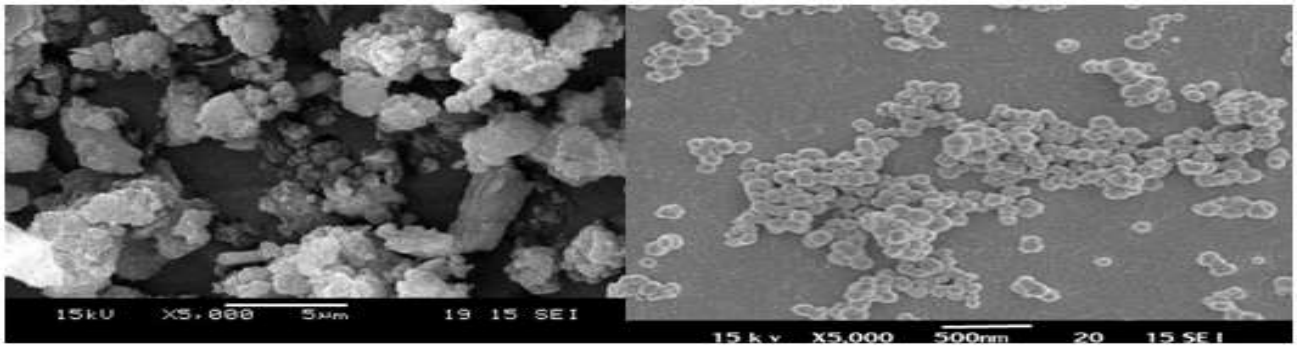

Figure 1,2: SEM Analysis of CP plant Extract and optimised Nanosuspension

The surface morphology graphs of extract of CP and Nanosuspension are presented in Fig.2a, 2b. Extract of CP showed crystalline nature. After sonication there was a considerable change in shape and surface morphology of Nanosuspension. CP exhibited shape of crystals whereas Nanosuspensiom appeared with smooth and spherical shape particles.

The TEM images of nanosuspension showed spherical surface of the particles. The obtained photomicrograph of the selected formulation is shown in Fig.3. The transmission electron micrographs showed that the prepared nanosuspension is in the nanosized range, which corroborated that particles size analysis through dynamic light scattering method was appropriate to measure the size.

TEM

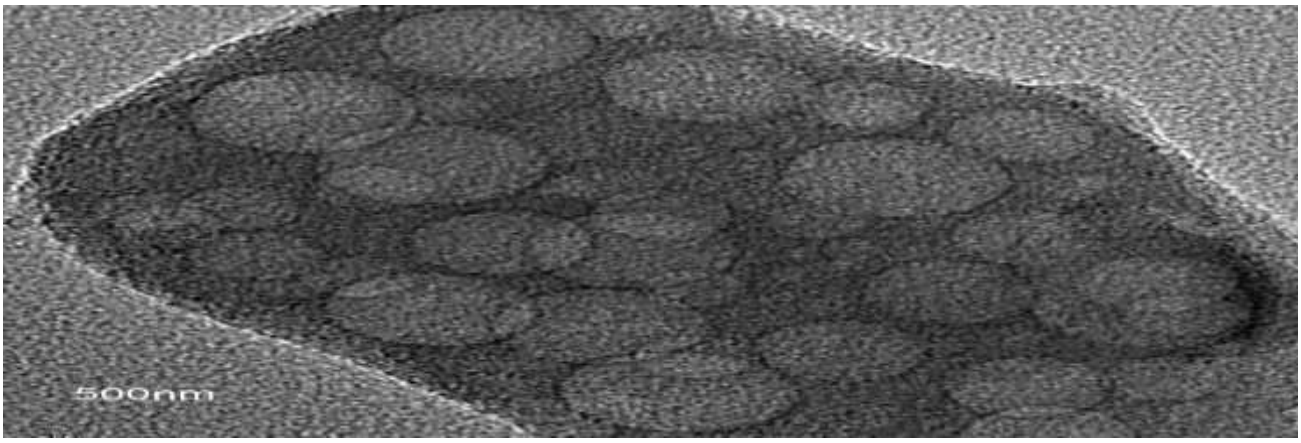

Figure 3: TEM analysis of optimised Nanosuspension

FTIR

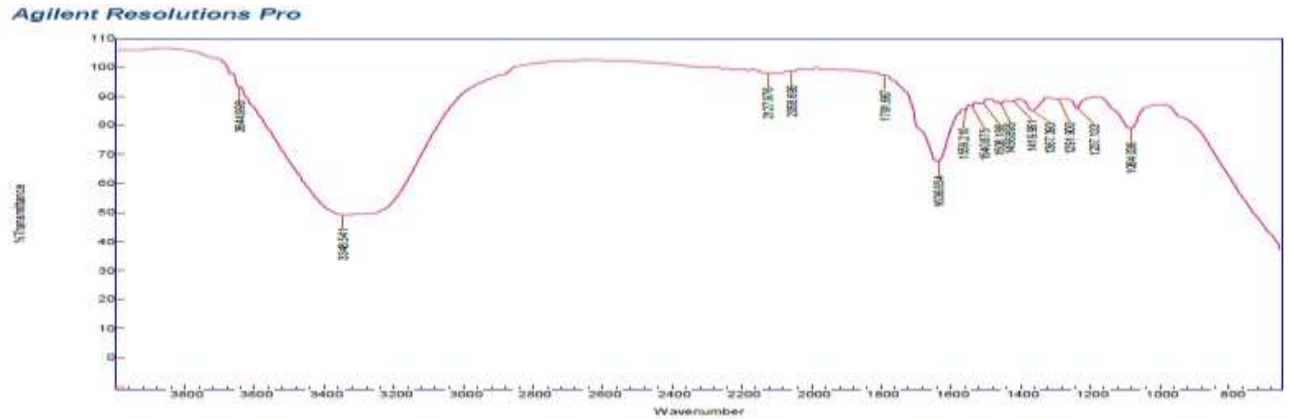

Figure 4: FTIR graph of CP Extract

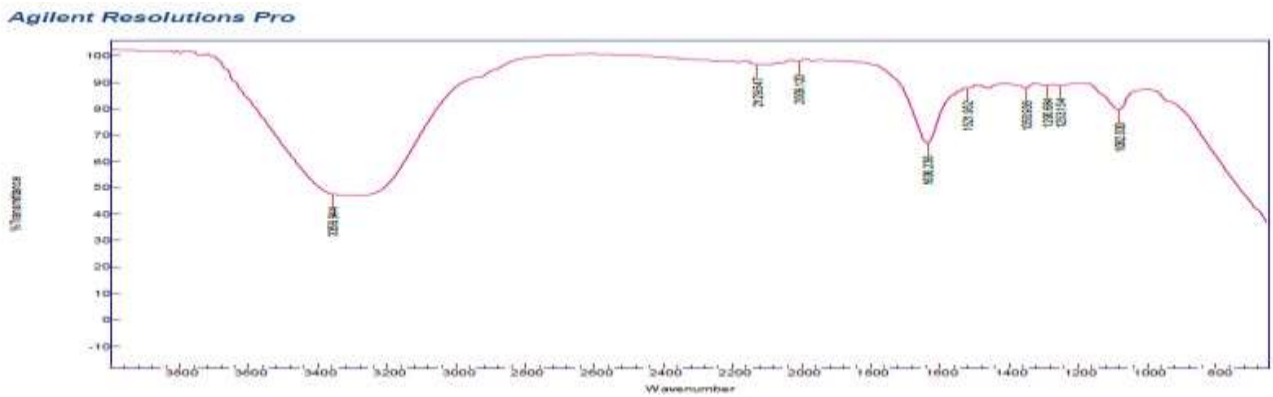

Figure 5 FTIR graph of Optimised Nanosuspension

FTIR studies for ethanolic extract of C.P and Nanosuspension shows peaks 3361.428 3255.59 2917.395 2849.552 and Nanosuspenion shows 3359.944, 2129.547, 2009.12, 1636.236 and common peaks are 3359, 2129, 2849.It implies that FTIR spectrum of plant extracts and its nanoparticles does not show any significant changes.

This result indicated that nanosuspension had all the characteristic peak and band values of extracts confirming the functional groups of extracts are well preserved.

Particle Size, Polydispersity Index and Zeta Potential Measurement

From the results, the calculated average particle size of nanoformulation is 536nm. and Polydispersity Index (PDI) of the formulation was 0.256 The zeta potential values lies between -16.4 to -17.9 mV Fig.10 suggesting the stability of nanoparticles.

This indicating that the prepared nanosuspension do not suffer from instability problems In general, zeta potential values from +30 mV to -30 mV are considered as a standard value in providing enough repulsion forces to avoid particle aggregation.

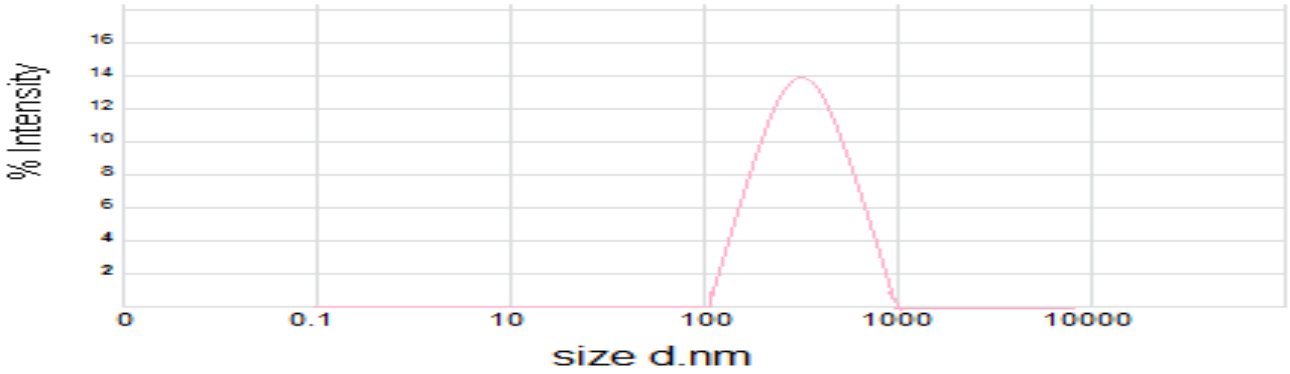

Figure 8: Average particle size of optimised Nanosuspension

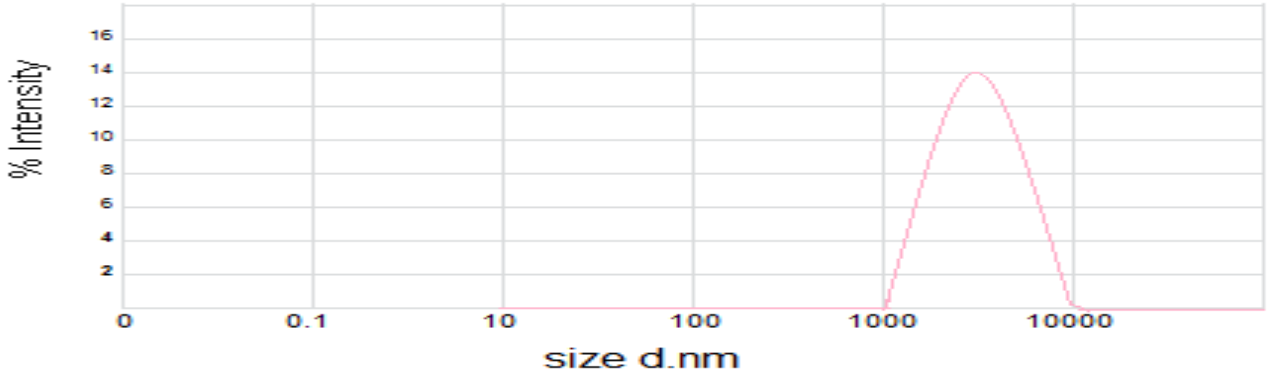

Figure 9: Average particle size of plant extract C.P

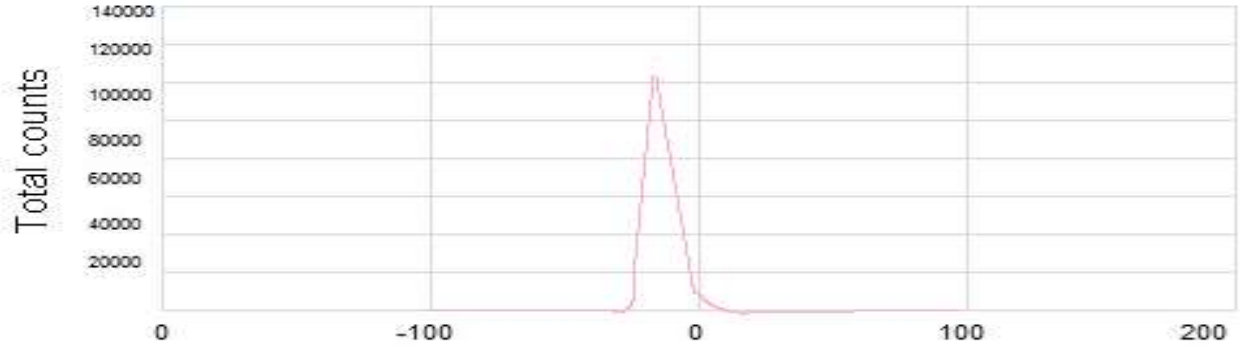

Figure 10: Apparent zeta potential of optimised Nanosuspension

Conclusion

In conclusion, sonoprecipitaion method can be employed to prepare the plant Nanosuspension. The results showed that within the nanometre range and shows good surface morphology, degree of crystallinity, dissolution profile compared with plant extract finally these nanosuspension are having a good therapeutic effect and bioavailbility

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