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RESEARCH ARTICLE

FORMULATION AND EVALUATION OF ZIDOVUDINE NANOSUSPENSIONS USING A NOVEL BIO POLYMER FROM THE SEEDS OF BUCHANANIA LANZAN

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ABSTRACT:

The aim of the research work was to isolate a novel bio material from the seeds of Buchanania Lanzan and to evaluate their potential for sustained drug delivery by formulating various nano suspension using methylene chloride as organic solvent and biomaterial. The biopolymer was isolated from the seeds of Buchanania Lanzan by simplified economical method.Five formulation were prepared using biomaterial in different ratios by solvent evaporation according to OECD guidelines. The formulated nano suspension were subjected for various evaluation parameters like particle size and shape, drug content, entrapment efficacy and % transmittance and invitro drug release studies. On the basis of invitro release studies, the formulation with increased amount of bio polymer (FNS4) was found to be better than the other formulations and it was selected as an optimized formulation . Invitro studies revealed that FNS4 followed perfect zero first order kinetics release. It was observed that the increasing the proportion of bio polymer increases the rate of release of zidovudine.

Key words: - Nano Suspension, Zidovudine, Buchanania lanazan.

INTRODUCTION:

Nanosuspension can be defined as sub-micron colloidal system which consists of poorly water-soluble drug, suspended in an appropriate dispersion medium stabilized by surfactants. Nanosuspenisons usually consist of colloidal carriers like polymeric resins which are inert in nature. They help in enhancement of drug solubility and thus bioavailability. Unlike microemulsions, they are also popular because of their non irritant nature. Flurbiprofen encapsulated in eudragit RS 100® and RL 100® polymer resins prevents myosis, which might be induced during extracapsular cataract surgery. Charge on the surface of nanoparticles facilitates its adhesion to the cornea. Animal studies have revealed that anti-inflammatory effect of nanosuspensions was more than microsuspensions. Similar studies were carried out using piroxicam in eudragit RS 100. In vivo studies in rabbits have shown significant anti-inflammatory effects compared to microsuspensions. In another approach, three different types of glucocorticoids; hydrocortisone, prednisolone and dexamethasone were formulated as nanosuspensions. In vivo study in rabbits suggested that the nanosuspensions significantly enhanced the ocular absorption of glucocorticoids. These nanosuspensions also produce sustained drug release and were more effective over a longer duration. Nanosuspensions also impart stability to the drug in the formulation.

Zidovudine/Azidothymidine (AZT), the first anti-HIV compound approved for the clinical use is widely used for treatment of AIDS either alone or in combination with other antiviral agents and Zidovudine is water soluble and soluble at all pH ranges and absorbs throughout the gastrointestinal tract Zidovudine acts as a metabolic antagonist of thymidine and its antiviral effect is time dependant so a sustained release delivery of AZT is desired to maintain anti-AIDS effect and avoiding severe side effects. By considering above facts, the present study was aim to

formulate and evaluate the sustained release matrix tablets of Zidovudine to prolong the release of drug for extended period of time in order to; Improve patient compliance, Reduce dosing frequency, Reduce side effects, Minimum plasma fluctuation, Increase bioavailability of the drug.

MATERIALS

The model drug zidovudine was obtained from macloids pharma pvt ltd. as a gift sample. All the reagents were of analytical grade. Double distilled water was used throughout the study.

ISOLATION OF BIO POLYMER FROM BUCHANAIA LANZAN

Seeds of *Buchanania Lanzan* were soaked in water for 2-3 hrs and the outer cover was removed. The seeds were grounded into a paste and then distilled water was added and filtered through muslin cloth. The milk was centrifuged and the supernatant liquid was separated and acetone was added in equal quantity and kept for 24 hrs. The settled biomaterial was separated by centrifugation for 5 -10 min and the isolated biomaterial was naturally dried and sieved through mesh size 120. The polymer obtained yields about 500 mg.

FORMULATION OF ZIDOVUDINE NANO-SUSPENSION USING THE BIO POLYMER

Four formulations were prepared by solvent evaporation method. The drug was added to methylene chloride and polymer in distilled water separately in magnetic stirrer. Then an aquous solution of polymer added in drug solution until methylene chloride evaporates. Then subjected to micro centrifugation and dried the nanoparticles.

Nanoparticles were suspended in 0.9% isotonic solution to prepare nano-suspension.

Table 1**: Formulation Prepared**

Formulation	FNS1	FNS2	FNS3	FNS4	FNS5
Zidovudine (mg)	50	50	50	50	50
Bio polymer (mg)	50	70	90	150	180
Methylene chloride (ml)	15	15	15	15	15
Distilled water	q.s	q.s	q.s	q.s	q.s

Evaluation parameters:

The nano suspension was evaluated for various parameters:-

1. Content uniformity
2. Entrapment efficiency
3. % transmittance
4. pH
5. Particles size and shape
6. *In-vitro* drug release studies.

Drug content uniformity

10ml of each formulation was taken and dissolved in 10ml isotonic solution and kept overnight. 10 mg (similar as in formulation) of drug was taken and dilution was made to 10µg/ml. The dilutions were filtered and analyzed using UV for their content uniformity. The absorbance of the formulations were read using one cm cell in a UV-Vis spectrophotometer. The instrument was set at 252 nm. The drug content in each formulation was calculated based on the absorbance values of known standard solutions.

Entrapment efficacy:

Entrapment efficacy was calculated by following formula:

%Entrapment efficiency= Drug content *100/Drug added in each formulation

%Transmittance

% Transmittance was measured by U.V spectroscopy at wavelength of 400 to 500nm. A graph for %particle range vs. formulations was plotted.

pH

The pH values were measured at 25 ◦C using a pH digital meter at 20 ± 1 ◦C. The formulation was brought in contact with the electrode of pH meter and equilibrated for 1 min. This method was done in triplicate and mean was calculated along with standard deviation.

Particle size and shape

Particle size and shape of the formulated microcapsules was determined by using Optical Microscope.

***In vitro* drug release**

In vitro drug release studies were performed in a dissolution apparatus using paddle method at rotation speed of 50 rpm. Dissolution was carried out both in acid media and neutral media using an equivalent of 10 mg of zidovudine. The volume and temperature of the dissolution medium were 900 ml and 37.0±0.2 °C, respectively. Samples were withdrawn at fixed times and were filtered and assayed through ultraviolet absorbance determination at 252 nm using a Shimadzu UV-Visible spectrophotometer.

RESULTS AND DISCUSSIONS:-

A novel bio polymer from Buchanania Lanzan was isolated by simplified economical process the yield was 500 mg . The bio polymer obtained was brownish to light brown color with a color changing point of 190-210 ^{0}C. The bio polymer showed positive tests for the carbohydrates and proteins.

Table 2: Physical properties of the bio material:

S.No.	Parameters	Observations
1	Color	light brown
2	Odor	Characteristic
3	Taste	Tasteless
4	Solubility	Water
5	Color changing point	190-210 ^{0}c ±10

Chemical properties of the bio material:

S.No.	Chemical constituents	Observations
1.	Carbohydrate	Present
2.	Protein	Present

EVALAUTION PARAMETERS:-

- **pH Measurement** The pH of the Nanosuspension was obtained in the range of 7.2 to 7.4 for all the formulations.Thus, the polymer is suitable for nanosuspension formulation.

 ISSN: 2250-1177 CODEN (USA): JDDTAO

- **Drug content:-** The drug content of the formulated nano suspension was found in the range of 1.96-4.59 respectively.
- **Entrapment efficacy:-** The entrapment efficacy of the formulated nano suspension was found to be in the range of 55.2%-96.6% respectively.
- **%Transmittance measurement**
- UV-Visible spectrum of pure Nanosuspension was recorded in range of 400-500 nm.

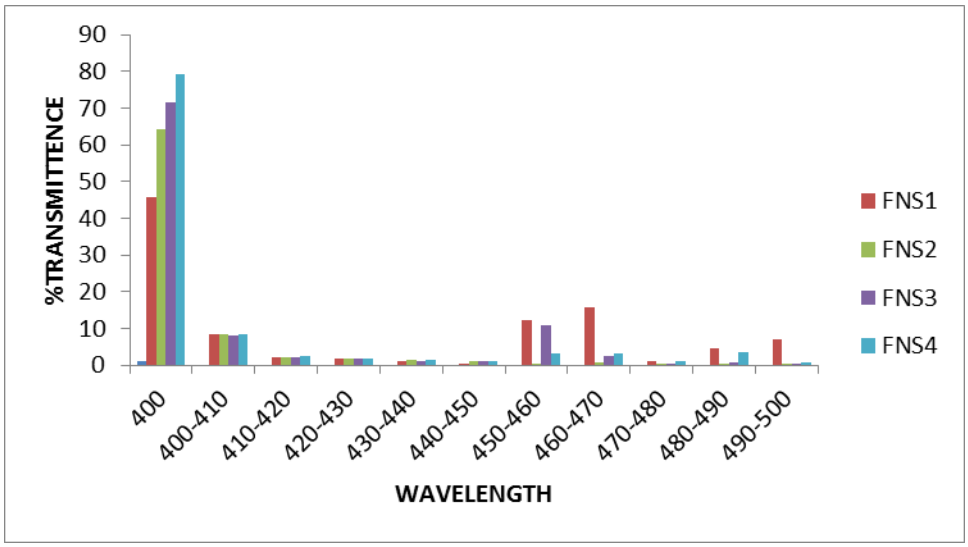

Figure 1: Shows recorded **%Transmittance measurement**

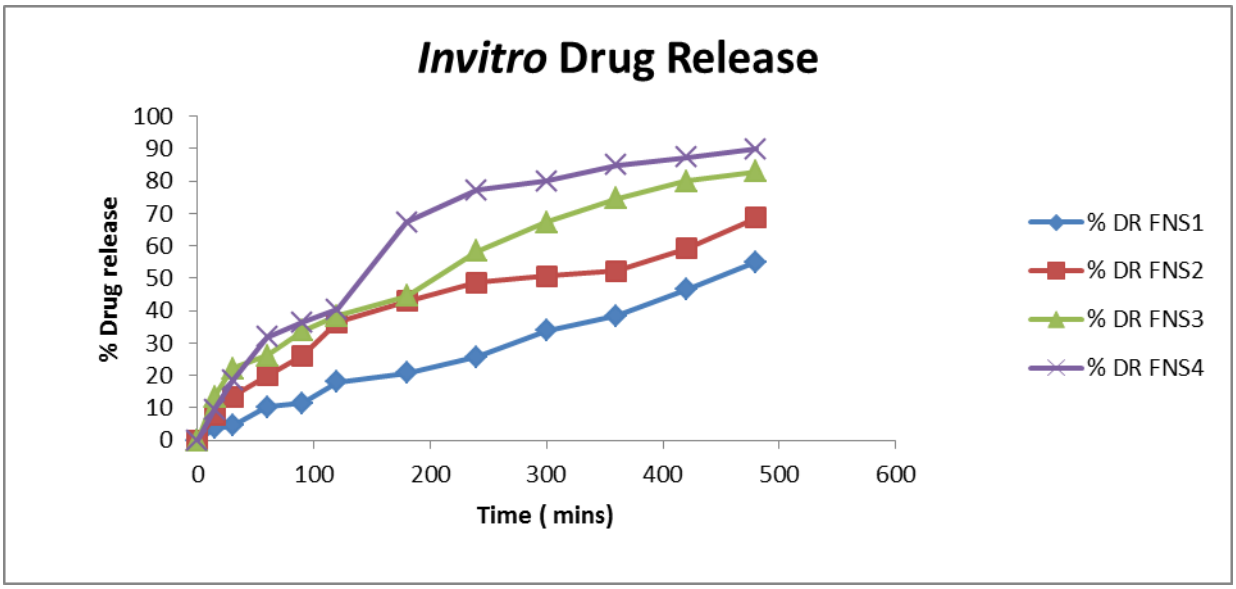

Figure 2: Invitro release study of the nano suspension of zidovudine.

DISCUSSIONS

A novel bio polymer from Buchanania Lanzan was isolated by simplified economical process the yield was 500 mg. the bio polymer obtained was of brownish to light brown colour with a color changing point of 190-210 ^{0}C. The bio polymer showed positive tests for the presence of proteins and carbohydrates. Four different formulations were formulated using different ratios of bio material for the preparation of ophthalmic films of tobramycin. The invitro release data in all the formulations was performed in zero order, first order, higuchi equation in order to evaluate its release mechanism.

CONCLUSION

Finally the experimental results had shown promising observations in terms of pH, drug content, entrapment efficacy and % transmittance. Here the conclusion was drawn that the isolated bio polymer has shown its potentiality for formulating nano suspension. The polymer can serve as potential polymer for formulating various drug loaded nano suspensions.

 ISSN: 2250-1177 CODEN (USA): JDDTAO

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 ISSN: 2250-1177 CODEN (USA): JDDTAO