FORMULATION AND EVALUATION OF ZIDOVUDINE MICRO EMULSION 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 its bio stabilizing ability by various formulating various zidovudine micro emulsions using sunflower oil as oil phase and bio material as bio emulsifier. The bio material was isolated from the seeds of Buchanania Lanzan by simplified economical method. Three different zidovudine micro emulsions were formulated using the bio emulsifier in different concentrations. The formulated micro emulsions were subjected to various evaluation parameters like globule size, ph effect of centrifugation, viscosity, surface tension and invitro drug release. The formulated micro emulsions exhibit uniform globule size, promising stability against centrifugation effect in comparison to standard emulsion. The drug release studies from the formulated micro emulsions exhibited a promising transparency, stability, uniform globule size and shape, surface tension for a period of 24 hrs. Finally the conclusion was drawn that the isolated bio emulsifier acts as novel emulsifier for formulating various drug loaded micro emulsions.

Key words: Micro emulsions, zidovudine, Buchanania Lanzan.

INTRODUCTION
The current aim of the our research work is to isolate a novel bio polymer from the seeds of Buchanania Lanzan and to evaluate its bio emulsifying ability by formulating various zidovudine micro emulsions using sunflower oil as oil phase and bio material as bio emulsifier. The bio material was isolated from the seeds of Buchanania Lanzan by simplified and economical process.

Zidovudine is a nucleoside analog reverse transcriptase inhibitor (NRTI), a type of anti retro viral drug. Like other reverse transcriptase inhibitors, AZT works by inhibiting the action of reverse transcriptase, the HIV enzyme uses to make a DNA copy of its RNA. Zidovudine is used in the treatment of HIV infections and prevention of maternal fetal hiv transmission.

Micro emulsion is defined as monophasic, thermodynamically stable, transparent (sometimes Translucent), isotropic, liquid mixture Cheng S et al., 2007, Shinoda K et al., 1973). It is a colloidal dispersion of oil and water which is stabilized by interfacial surface film of low viscosity (Schott H, 2000). The interfacial tension in micro emulsion is reduced by use of surfactant in combination with a co-surfactant (Schulman JH et al., 1959, Friberg S et al., 1978). The globule size of a micro emulsion lies between 10-100 nm. micro emulsion acts as a drug carrier for percutaneous, ocular, oral and parenteral administration. The use of micro emulsion is advantageous not only due to facile and low cost preparation but also because of improved bioavailability.
(Ruckenstein E et al., 1975, Turner SR et al., 1985). Two immiscible liquids can form a micro emulsion a single phase in which one of liquid is dispersed in the other forming micro sized aggregates that are stabilized by a surfactant and co-surfactant, which lowers the interfacial tension between two liquids (Overbeek, J Th G, 1978). Micro emulsions represent a state intermediate between thermodynamically stable solution i.e. micelles containing solubilized oils and ordinary emulsion which are relatively unstable (Nairn JG, 2000).

Three types of micro emulsions are known depending on the composition-

1. Oil in water type micro emulsion where oil droplets are dispersed in the continuous aqueous phase.
2. Water in oil type micro emulsions where water droplets are dispersed in the continuous oil phase.
3. Bi-continuous micro emulsions where micro domains of oil and water are inter-dispersed within the system.

Micro emulsions also refer to an aqueous suspension of pseudo micelles which contain relatively hydrophobic lipid centers surrounded by a monolayer of amphipathic molecules bearing hydrophilic moieties (Prince LM, 1967).

Theories explaining the Formation of Micro Emulsions are

1. Interfacial or mixed film theory
2. Solubilization theory
3. Thermodynamic treatment theory

MATERIALS
The model drug zidovudine was obtained from the macloids pharma. All the reagents were of analytical grade. Double distilled water was used throughout the experiment.

ISOLATION OF BIO POLYMER FROM BUCHANANIA LANZAN SEEDS
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 MICRO EMULSION USING BIO POLYMER-

Three different micro emulsions were prepared by the aqueous phase titration method. Micro emulsions were prepared by dissolving specified amount of drug in sunflower oil then co surfactant was added in the mixture containing the oil and the drug, the sufficient quantity of distilled water is added to make the final preparation 100% w/w.

<table>
<thead>
<tr>
<th>TABLE 1. FORMULATIONS PREPARED</th>
</tr>
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<tbody>
<tr>
<td>Ingredients</td>
</tr>
<tr>
<td>Drug(zidovudine) (mg)</td>
</tr>
<tr>
<td>Sunflower oil (ml)</td>
</tr>
<tr>
<td>Methanol (ml)</td>
</tr>
<tr>
<td>Bio polymer (mg)</td>
</tr>
<tr>
<td>Distilled water (ml)</td>
</tr>
</tbody>
</table>

EVALUATION PARAMETERS
The micro emulsions were evaluated for the following parameters:-

- **Viscosity**: - The viscosity of micro emulsion was determined by using the Ostwald viscometer.
- **Globule size**: - The globule size was determined by using the optical microscopy.
- **pH**: - The ph of the micro emulsion was measured using thr digital ph meter taking ph 7 as standard.
- **Surface tension**: -The surface tension of micro emulsion was measured using steelegmometer.
- **Drug content**: - The drug content was determined to ensure that every dosage form contains the amount of drug substances intended with little variation within a batch due to increased awareness of physiological availability, the content uniformity test has been included in the monographs dosage forms intended for oral administration where the range of size of dosage form available include 50 mg or smaller sizes. In micro emulsions 1 ml of each was diluted with 19 ml of alcohol and was subjected to orbital shaker for 30 mins. The mixture was taken and the drug content was analyzed.

In vitro drug release
The release studies were performed for the formulated micro emulsion in the dissolution apparatus for 10 hrs in ph 1.2 for first 4 hrs and was further was replaced by alkaline pH.

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 °C
(Table 2-4). The bio polymer showed positive tests for the carbohydrates and proteins.

**TABLE 2. Physical properties of the bio material**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Parameters</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Color</td>
<td>light brown</td>
</tr>
<tr>
<td>2</td>
<td>Odor</td>
<td>Characteristic</td>
</tr>
<tr>
<td>3</td>
<td>Taste</td>
<td>Tasteless</td>
</tr>
<tr>
<td>4</td>
<td>Solubility</td>
<td>Water</td>
</tr>
<tr>
<td>5</td>
<td>Color changing point</td>
<td>190-210 °C ±10</td>
</tr>
</tbody>
</table>

**TABLE 3. Chemical properties of the bio material**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Chemical constituents</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carbohydrate</td>
<td>Present</td>
</tr>
<tr>
<td>2</td>
<td>Protein</td>
<td>Present</td>
</tr>
</tbody>
</table>

**EVALUATION PARAMETERS**

**Globule size and shape**

The globules were observed to be spherical in shape with a size in the range 0.166-0.182 µm (Fig 1).

**Content uniformity**

The content uniformity varied from 79.54% to 84.98% with the formulation FMZ1 showing the highest content uniformity of 84.98% (Fig 2).

**TABLE 4. Different Parameters**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Parameter(s)</th>
<th>FMZ1</th>
<th>FMZ2</th>
<th>FMZ3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Viscosity (cps)</td>
<td>16.78</td>
<td>23.65</td>
<td>29.08</td>
</tr>
<tr>
<td>2</td>
<td>Globule size (mm)</td>
<td>0.166</td>
<td>0.178</td>
<td>0.182</td>
</tr>
<tr>
<td>3</td>
<td>Surface tension (dynes/cm)</td>
<td>59.08</td>
<td>45.67</td>
<td>43.23</td>
</tr>
<tr>
<td>4</td>
<td>Ph</td>
<td>6.78</td>
<td>6.99</td>
<td>7.04</td>
</tr>
<tr>
<td>5</td>
<td>Content uniformity</td>
<td>84.98 %</td>
<td>79.54 %</td>
<td>80.21 %</td>
</tr>
</tbody>
</table>

**INVITRO RELEASE**

**Fig 2. Content Uniformity of Micro Emulsion**

**Fig 3. Invitro release studies of the micro emulsions of zidovudine**

**Fig 4. Viscosity size of micro emulsions**

**Invitro release studies:** - The invitro release data in all the formulations was performed in zero order, zero first order, higuchi equation in order to evaluate its release mechanism. The result showed the zero first order release pattern. Among the formulations FMZ3 had a t50 and t80 of 3.2 hrs and 5.3 hrs respectively (Fig 3).

**DISCUSSIONS**

A novel bio polymer from Buchanania Lanzan was isolated by simplified economical process the yield was
2.5 % per 100 g. the biopolymer obtained was of brownish to light brown in color with a color changing point of 190-210 °C. The biopolymer showed positive tests for the presence of proteins and carbohydrates. Three different formulations were formulated using various proportions of biomaterial for the preparations of micro emulsions of zidovudine. The in vitro release data in all formulations were performed in zero first order, zero order, higuchi equation in order to evaluate its release mechanism. The results show the zero first order release pattern. The result shows the higuchi release pattern. Among the three formulations FMZ1 shows a globule size of 0.166, ph of 6.78, surface tension of 59.08dynes/cm and viscosity of 16.78 cps. The content uniformity was found to be 84.98%. The values of t50 and t80 were found to be 3.2 hrs and 5.3 hrs.

CONCLUSION
Finally the experimental results had shown a promising observation in terms of globule size, content uniformity, stability in ph, viscosity and surface tension. Hence conclusion was drawn that the isolated polymer has shown its potentiality as bio emulsifier for formulating micro emulsions. The polymer can serve as potential polymer for formulating various drug loaded micro emulsions.

REFERENCES