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Evaluation of naproxen emulsion formulated using moringa oleifera seed oil: A research

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Abstract
For the consumption of less hydrophobic medications, there has been a boost in interest in lipid-based formulations in recent years. The medications that are poorly soluble in water arrive via the inner oil phase of the O/W emulsion. The aim of this study is to analyse the physicochemical characteristics of an emulsion of naproxen made using Moringa oleifera seed oil as the oil phase. By using the wet gum method, this moringa oleifera oil is used to generate an emulsion. Physical and chemical characteristics including pH, viscosity, and organoleptic characteristics were used to assess the created emulsion. Acacia gum, methyl paraben, and propyl paraben were utilised in this research to serve as excipients in the naproxen emulsion. Acacia was used as the emulsifier and Moringa seed oil as the oil phase to generate a stable Naproxen emulsion. The emulsion were comparable in physicochemical properties and stability to formulations with different quantity.

Keywords: naproxen, emulsion, moringa seed oil, acacia, oil-in-water

Introduction

A system called as an emulsion consists of at least two immiscible liquid phases, one of which is disseminated as globules in the other liquid phase and sustained by a third component known as an emulsifying agent. There are now three distinct kinds of emulsion

1. Macroemulsion of a simple emulsion: The diameter of the water-in-oil (W/O) and oil-in-water (O/W) mixtures of this type should be more than 0.1 micrometre. Water-Oil-Water (W/O/W) and Oil-in-Water-in-Oil (O/W/O) are two distinct forms of emulsion. 3. Micro (or nano) emulsion. There are four primary ways to carry out the emulsification

Process: dry gum, wet gum, forbes bottle, and auxiliary. Wet gum approach is employed in this Nproxen emulsion to create an emulsion. Gum is first mixed with water to develop a primary emulsion, and then oil is added. Important dose forms for medications that are poorly soluble are emulsions. Liquid emulsion can be used orally, topically, or parenterally depending on the ingredients and the intended use. The benefits of employing emulsions as dosage forms include the

Following: Uneatable oils can be administered in eatable form.

- Masked the taste of oil.
- When compared to solid dosage forms its absorbsion is faster.
- It is easy to involve two inconsistent ingredient one in each phase of the emulsion.

Drug profile

Naproxen sodium

A non-steroidal anti-inflammatory medicine is naproxen. It functions through lowering hormones that lead to pain and inflammation in the body. Naproxen is used to treat gout, menstrual pain, tendinitis, bursitis, and arthritis. The antipyretic and analgesic properties of naproxen sodium. The analgesic and anti-inflammatory actions of naproxen are caused by the competitive inhibition of both cyclooxygenase (COX) isoenzymes, COX-1 and COX-2, which is accomplished by blocking arachidonate binding. that prevents the production of prostaglandins, which are responsible for fever, inflammation, and discomfort. Drugs have a half-life of 12 to 17 hours. Because of its lengthy half-life and great analgesic potency, it maintains steady blood levels and efficacy.

Moringa Oleifera

Moringa Oleifera is softwood tree and also called drumstick tree, ben oil tree or horseradish tree. Moringa Oleifera belongs to family Moringaceae. In most of species moringa oleifera lam is most popular and utilized species. It is fast growing and artistic taste small tree. It is grown in countries like India, sudan, west Africa. As food or medicine various parts of Moringa oleifera tree are eaten by humans. Moringa oleifera has used as medicinal agent due to presence of various important antibiotics, antioxidants and nutrients such as vitamins and minerals. Moringa seed is composed of 36.7% by weight of moringa seed oil. This oil is liquid at room temperature and have golden yellow in colour. Moringa oleifera seed oil naturally have monosaturated fatty acids. Oleic acid gives more attention for its great stability and good nutritional characteristics. The oil has saturated fatty acids and few amount of polyunsaturated fatty acids which build up great significant resistance to oxidative degradation. The oil has rich amount of fatty acids, hydrocarbons, aldehyde, esters and oxygenated hydrocarbons. Various properties of oil are reported like anti-microbial, antioxidant, anti- inflammatory and also as nutritional. For anti-inflammation Moringa Oleifera isused because flavonoids are present in different part of plant. In this study, the whole attention is on Moringa seed oil to its medicinal characteristics and also its use as pharmaceutical excipient in the formulation of naproxen emulsion.

Fig 1

Methyl Paraben and Propyl Paraben

Preservatives are added to an assortment of food, cosmetic, and pharmaceutical goods to stop bacterial action-induced deterioration. The most widely used preservatives overall are parabens. Because they are less hazardous to people and work better as antimicrobial agents, particularly against mould and yeast, they are widely employed. In paraben combinations used in consumer products, methyl and propyl parabens are frequently found combined.

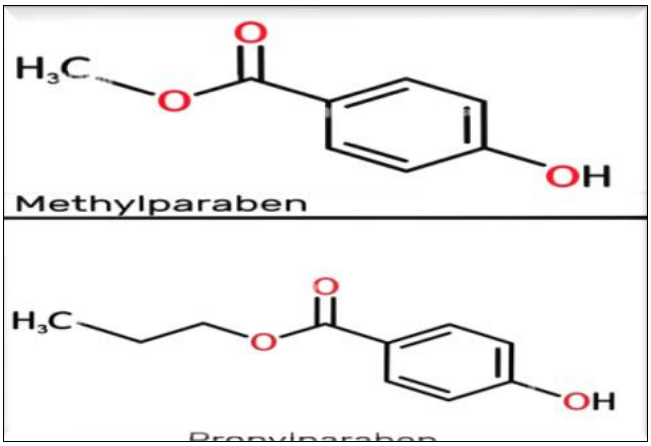

Fig 2

Acacia gum

Acacia gum is frequently utilised in the food sector because of its capacity to emulsify. Senegelia Senegal is a member of the fabaceae family. It is also known as sudan gum and the Arabic gum tree. It is a polysaccharide complex with acidic branches. Its chemical structure indicates that its molecular weight is around 3.105 g/mol. Emulsion is a mixture of two immiscible liquids, like oil and water. Emulsifiers are typically used to promote emulsion stability because both phases are complicated systems.

Fig 3

Materials and Methods

Moringa Oleifera seeds were purchased from local market of baramati, pune. Other components like methyl and propyl paraben, acacia gum are available from our college laboratory (Baramati college of Pharmacy). Also Naproxen drug is available from our college laboratory.

Extraction of Moringa seed oil

Moringa oleifera seeds were discarded, dried and pulverized it by using a manual milling machine.

↓

Take 150 gm of powdered Moringa seeds and extracted it at 60^0C with petroleum ether using soxhlet apparatus for 6 hours.

Evaluation of Moringa seed oil

The moringa seed oil was evaluated by following factors:

- **Refractive index**
  The refractive index was determined using ABBE model refractometer

- **Density**
  Take a specific volume of seed oil and transfer it into density bottle which is already weighed. Then after transfer the oil new weight was recorded. The density of seed oil was measured by following formula

$$\text{Density of moringa oil} = \frac{\text{Weight of oil}}{\text{Volume of oil}}$$

- **Specific gravity**
  Specific gravity was measured by using specific gravity bottle. Weigh of the empty bottle then bottle was filled with water and re-weighed. Then bottle was filled with oil and re-weighed. The density of oil was calculated by using following formula

$$\text{Specific gravity} = \frac{\text{Weight of oil}}{\text{Weight of water}}$$

Method of Preparation of Naproxen emulsion

Table 1: Ingredients and their role in formulation of emulsion.

Ingredients	Role
Naproxen drug	Pain relief
Moringa seed oil	Oil phase
Acacia gum	Emulsifying agent
Methyl paraben	Preservative
Propyl paraben	Preservative
Water	Vehicle

Composition of Naproxen emulsion

Table 2: Composition of formulation of emulsion

Ingredients	Quantity		
	F1	F2	F3
Naproxen drug	0.5gm	0.5gm	0.5 gm
Moringa oil	14.5 ml	14.5ml	15.3ml
Acacia	3.6gm	4.0gm	4.5gm
Parabens	0.2gm	0.2gm	0.2gm
Water	q.s.	q.s.	q.s.

Preparation of Naproxen emulsion

From the table no.1(F1) Naproxen emulsion was prepared by wet gum method. As we used fixed oil the ratio of oil, water and gum was 4:2:1. First take a clean mortar and pestle. Then 3.6 gm of acacia was measured and transfer it into mortar then add 7.5ml distilled water and 0.2gm of methyl and propyl paraben together and triturate it with constant stirring. This is our liquid phase. Then in other mortar take 0.5 gm of naproxen drug dissolved into 14.5 ml moringa oil. This oil phase is add into aqueous phase in small quantity. This mixture is was continuously triturated in clockwise direction until oil phase is completely mixed with aqueous phase to form a primary emulsion. Then prepared mixture is transferred into measuring cylinder and make up the volume upto 25ml by adding distilled water. Then it was labelled and sealed. The same procedure was repeated for different quantities mentioned in table no. 1 (F2andF3).

Factorial design

An experiment using a factorial design is one in which the effects of several elements are looked into at once. When a researcher is unsure of how two or more independent factors will affect a single dependent variable, they will utilise a factorial design. The independent and dependent variables' identities are determined during the experimental design process. The researcher has control over the independent factors. Changes, which are a result of the independent factors, are the dependent variable, and changes are what the researcher measures. A factorial design can deliver more information for the same or less money. Additionally, it offers more variables to look into and shows how various variables impact dependent variables.

Evaluation of Naproxen emulsion

In this study we examine organoleptic properties, pH, specific gravity and emulsion type of the prepared emulsion.

Organoleptic properties

The odour, colour and appearance of the emulsion were observed or properties were also observed by stability studies.

Determination of emulsion type

1. **Dilution test**
   In this test take 5ml prepared emulsion in test tube and add in it unlimited quantity of water observed emulsion if it is stable then it is o/w type and if it is unstable then it is w/o type of emulsion.

2. **Staining test**
   In this test, small amount of water-soluble dye such as methylene blue is added to emulsion, Now if dye will dissolved uniformly then it is o/w type and if not dissolved it is w/o type of emulsion.

pH

The pH is measured by using pH meter. In this, pH meter was calibrated by using neutral liquid thereafter pH probe was dipped into a beaker containing 25ml of the emulsion. After few seconds reading was recorded. This was also done for another batches.

Specific gravity

Specific gravity carried out using specific gravity bottle. The specific gravity bottle weighed. Then after filling with water it is re-weighed. Then fill the specific gravity bottle with prepared emulsion and weighed the bottle.

Result and discussion

Evaluation results of moringa seed oil

1. **Refractive index**
   The standard limit of refractive index was 1.4677-1.4705. The refractive index for the extracted moringa seed oil was within acceptable limit i.e. 1.463+-0.002 at 27^0C. Refractive index can be used to examined the contamination.

2. **Density**
   The density of oil was found to be close to the density of water. The density of moringa seed oil was 0.95+-0.01 g/cm^3.

3. **Specific gravity**
   The specific gravity of extracted moringa seed oil was obtained is 0.93Kg/m^3. This value is within acceptable limit (0.9-1.17).

Evaluation parameters of oil

Table 3: Evaluation parameters of formulation of emulsion

Parameters	Results
Refractive index	1.463
Density	0.95g/cm^3
Specific gravity	0.93Kg/m^3

Evaluation properties of emulsion

Organoleptic properties

Table No. 4 provides information about the emulsion's aroma, colour, and physical appearance. Our emulsion's aroma exhibited traits of the emulsifying oil. Acacia gum-based formulations have a light brown or cream tint (F3). With the exception of formulation F1, which creamed, the formulations were stable. It has negative consequences when handled and stored. Creaming may be prevented by simply shaking the emulsion, thus it is not a severe issue. If it is not shaken properly, it will not produce the desired results.

Table 4: Organoleptic properties of Naproxen emulsion formulation

Formulations	Odour	Colour	Appearance
F1	Distinctive	Light brown	Good
F2	Distinctive	Light brown	Good
F3	Distinctive	Cream	Good

Physicochemical properties

pH

The pH of the freshly developed emulsion ranged from 5.4–6.1, as shown in table no. 5. Since the medicine had an immediate influence on the acidity and an acidic emulsion frequently develops an O/W emulsion, naproxen has an acidic pH of 3.7.

Viscosity

The emulsion's viscosity ranged from 1500 to 2000 mPas (Table no. 5). This suggested a stable situation.

Density

According to Table No. 5, the emulsion's density ranged from 0.98 to 1.03 g/ml.

Emulsion type

According to Table No. 5, all prepared emulsions were of the oil in water variety.

Table 5: Physicochemical properties of Naproxen emulsion formulation

Formulation	pH	Viscosity	Density	Type
F1	5.4	1500mPas	1.03g/ml	O/W
F2	5.7	2000mPas	1.00g/ml	O/W
F3	6.1	1500mPas	0.98g/ml	O/W

Conclusion

This study proved that the oil phase in the creation of a stable naproxen emulsion was made of moringa seed oil. Acacia gum serves as the emulsifying agent in this emulsion. The formulation and evaluation of naproxen emulsion by a number of criteria ensured its efficacy and safety when taken orally. This emulsion was used to treat gout, arthritis, and discomfort associated with such conditions.

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