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Formulation and Characterization of Multiple Emulsion of Ascorbic Acid

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Abstract

Ascorbic acid is also called Ascorbates or Vitamin C. The present study was investigated to carried out for the preparation of multiple emulsion for the care of skin (cosmetics); multiple emulsion water-in-oil-in-water (w/o/w) formulations containing Ascorbic acid was prepared by Primery Emulsion (50.0ml) (Composition: Ascorbic acid- 100mg, Caster oil- 40.0ml, Span20- 2.5% w/v, Water- 10.0ml), Water (50.0ml) and Tween80- 2% w/v. Multiple emulsions were characterized with different parameters like pH (by pH meter), Average particle diameter (by Occular microscopy), Density and viscosity of the multiple emulsion (by viscometer), and in-vitro drug release study (U.V. Spectroscopy).

Keywords: Ascorbic acid, Simple emulsion, Cosmetics, Multiple emulsion etc.

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1. Introduction

Multiple emulsions are vesicular and complex systems^[1]. They can be considered as emulsions of emulsions and have shown promise in cosmetic^[2, 3], pharmaceutical and separation sciences^[4]. Their potential pharmaceutical applications include uses such as taste masking, adjuvant vaccines, an immobilization of enzymes and sorbent reservoir of overdose treatments, and for enhancement of enteral or dermal absorption^[5-8]. Multiple emulsions have been formulated as cosmetics, such as skin moisturizer^[9]. Prolonged release can also be obtained by means of multiple structures^[10-13]. These systems have some advantages, such as the protection of the entrapped substances and the incorporation of several actives in the different compartments^[16].

Despite their potential usefulness, applications of multiple emulsions have been limited because of thermodynamic instability and their complex structure. Water/oil/water (w/o/w) multiple emulsions consist of dispersed oil globules containing smaller aqueous droplets; each inner aqueous droplet is separated from the outer aqueous phase by an oil phase layer. The presence of at least two surfactants is required. One of them is predominantly lipophilic for stabilizing the primary water/oil (w/o) emulsion and the other is hydrophilic for the secondary oil/water emulsion. To produce a w/o/w emulsion, the lipophilic and hydrophilic surfactants are dissolved in oil and continuous aqueous phase, respectively. The most common preparations of w/o/w double emulsions are based on the two-step emulsification process. The stability and release characteristics of multiple emulsions are influenced by different factors, such as surfactant type, surfactant ratio and some physical properties of the system (globule size, viscosity, conductivity, phase volume ratio, etc)^[1, 17, 18].

2. Materials and Methods

2.1 Chemicals:

The following substances were used for the preparation of multiple w/o/w emulsions:

Ascorbic acid, Caster oil, Span20- 2.5%w/v, Distilled Water and Tween80- 2%w/v obtained from reputed lab.

2.2; Apparatus: Glasswares (beaker, measuring cylinder, volumetric flask, test tubes, magnetic stirrer, glass rods etc.) U.V. spectroscopy, Pycnometer, Compound microscope, Occular lens, pH meter and Cellophane membranes etc.

2.3. Preparation of w/o/w multiple emulsion

Multiple emulsions were prepared by a two-step emulsification process^[2]. The first emulsification was to prepare the w/o primary emulsion and the second emulsification step provided the formation of the w/o/w multiple globules. The compositions of formulations are shown in Table 1. Initially 40.0ml of castor oil taken in a beaker and span20-(2.5%) added into the beaker, placed below the mechanical shaker. During the shaking Ascorbic acid was added into it with the addition of water subsequently to form Primary emulsion. For the preparation of multiple emulsion primary emulsion about 50.0ml was taken in a beaker, water and tween80-(2%) was added to prepare 100.0ml of multiple emulsions.^[19]

Table 1. Composition of Primary Emulsion

S.No	Ingradients	Amount
1	Ascorbic acid	100.0mg
2	Castor oil	40.0ml
3	Span20-(2.5%)	2.5g
4	Water	10.0ml

Table 2. Composition of Multiple Emulsion

S.No	Ingradients	Amount
1	Primary emulsion	50.0 ml
2	Water	50.0ml
3	Tween80 (2.0%)	2.0g

3. Characterization

3.1 pH: pH of the multiple emulsions was determined by pH meter.

3.2 Particle size:

Average particle diameter was calculated by ocular microscopy.

3.3: Microscopic analysis:

Microscopic analysis was carried out using an optical immersion microscope and observations were made at 10x magnification after diluting in the appropriate external phase of emulsion. This examination provided direct information on the multiple structures. We could see the internal aqueous phases as droplets in a w/o/w emulsion structure. The existence of multiple globules was checked microscopically during all experiments until the phase separation was observed.

3.4 Viscosity:

For the viscometric measurements, the samples of multiple emulsions were examined using Ostwald viscometer. It was also carried out during storage time at 25 and 40°C, and all measurements were performed three times. The viscosity values that were calculated by drop count method.

3.5 In-vitro drug release:

Dialysis tubing was used as a membrane for the release study and was washed several times with distilled water and left soaking in buffer solution (pH 5.2) overnight before use. Immediately after preparation, 2 g of the multiple

emulsions containing Ascorbic acid was introduced into the dialysis tubing double-tied at each end and dialyzed in 300 ml buffer solution of pH 7.4 as the release medium at 32 ± 1 °C under constant stirring. Two milliliters were withdrawn from the dialysis medium and replenished with the same volume of fresh buffer solution at an hour interval. The concentration of the Ascorbic acid dialyzed was analyzed spectrophotometrically at 650 nm.

4. Results and Discussion

pH of the multiple emulsion was found to be 4.1; it was determined by pH meter. It is acidic in nature, so it contributes to prevention of infections and promotes skin repair. Globule size (average particle diameter) of the multiple emulsions was calculated by ocular microscopy and that was found to be 0.366µm. Viscosity was found to be 0.153poise. The density of the multiple emulsions was found to be 1.0956 mg/ml. *In-vitro* drug release was found to be 83.41% in 24 hrs.

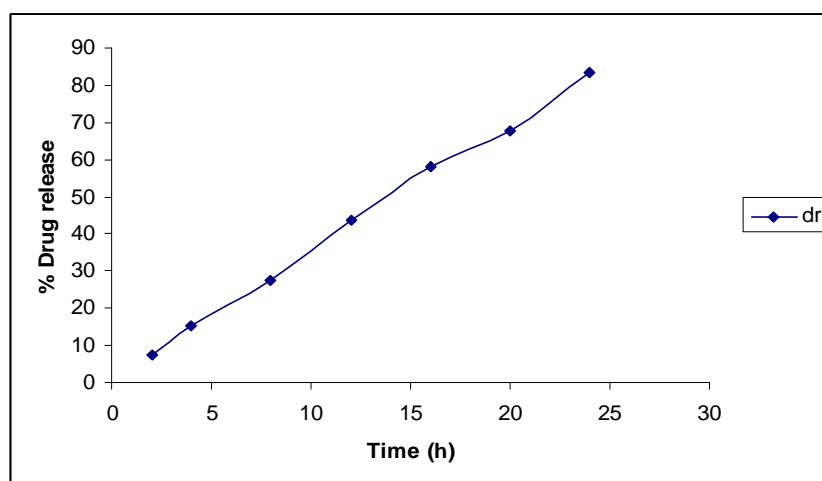


Figure 1. *In vitro* drug release

5. Conclusion

Ascorbic acid is also known as L-ascorbic acid or Vitamin C, is a water soluble Vitamin. It is required for biosynthesis of certain neurotransmitters. Vitamin C is involved in protein metabolism. Vitamin C is also an important physiological antioxidant. Vitamin C is sensitive to heat, light and oxygen. Multiple emulsion is used for the care of skin (cosmetics) due to its better release rate.

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