IJFANS INTERNATIONAL JOURNAL OF FOOD AND NUTRITIONAL SCIENCES
ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 12, Iss 1, 2023

EXPLORING THE THERAPEUTIC POTENTIAL: FORMULATION AND ASSESSMENT OF MICROEMULSION INCORPORATING CHAMOMILE AND CEDARWOOD OIL AS ACTIVE INGREDIENTS

Goswami Raksha*[1], Jain Neetesh Kumar [2]
[1] Research Scholar, Faculty of Pharmacy, Oriental University, Indore, M.P., India
[2]Professor, Faculty of Pharmacy, Oriental University, Indore, M.P., India
*Corresponding Author Email: rakshag23@gmail.com

ABSTRACT

Objective: In order to investigate the possible therapeutic benefits of chamomile and cedarwood oil, this study formulates and assesses a microemulsion from these two active ingredients. Owing to their increased bioavailability and solubilization capability, microemulsions hold great promise as delivery systems for bioactive substances. Many medicinal qualities, such as anti-inflammatory, antibacterial, and antioxidant effects, are well-known for chamomile and cedarwood oil.

Methods: By building a pseudoternary phase diagram, the existence zone of the microemulsion was found. Ether as a co-surfactant and Tween 80 as a surfactant were used to create the microemulsion. The microemulsion formulation's test results for dye solubility, viscosity, conductivity, pH, and thermodynamic stability are all characterised.

Results: Since most formulations were clear, phase diagram building and the phase titration approach proved to be an effective way for creating microemulsions. According to the outcomes of stress testing, the optimised formulation exhibited both chemical and physical stability. It was discovered that the prepared microemulsions have little viscosity. The optimised formulations that were developed were determined to be w/o type microemulsions based on electrical conductivity and staining tests. In the stability trial, even after being kept for 30 days and centrifuged for 30 minutes at 3000 RPM, no phase separations happened.

Conclusion: The current study's attempt to create a unique water-in-oil microemulsion was successful. utilising this cutting-edge method to administer naturally occurring oils with pharmacological activity and investigating possible synergistic effects of combination with improved therapeutic outcomes.

Keywords- Cedarwood oil, Microemulsion, Chamomile oil, Novel drug delivery system, Tween 80.

Address of correspondence:
Raksha Goswami
Research Scholar
Mail id:- rakshag23@gmail.com
Contact no. 8878409480

INTRODUCTION

Microemulsions are a unique class of drug delivery systems that consist of a transparent, isotropic combination of oil, co-surfactant, and surfactant that is thermodynamically stable. Enhancing the solubility and bioavailability of poorly soluble drugs is facilitated by microemulsion. Because the microemulsion can make the medicine more soluble and permeable in the gastrointestinal tract, it can improve the drug's oral bioavailability. Due to its higher penetration rate, it also enhances the medication's distribution via cutaneous transport[1,2].

Water, surfactant, and oil are combined to create thermodynamically stable microemulsions. Large concentrations of surfactants are what provide the stability. There are primarily three types of microemulsions:[2]

Oil in water type microemulsion

This kind has oil droplets scattered across an aqueous phase that is continuous.

Water in oil type microemulsion

Water droplets are distributed across a continuous oil phase in this form.

Bi-continuous microemulsion

Water and oil are spread throughout the system in this kind of microdomain.

Matricaria chamomilla and Cedrus deodara, respectively, provide essential oils that are known as chamomile oil (CO) and cedarwood oil (CWO). They have previously been shown to reduce stress, anxiety, and promoting relaxation and they also have antibacterial, antifungal, and anti-inflammatory properties.[3,4] Due to their volatile nature and sensitivity to heat, chamomile and cedarwood oils can have their self-life extended when used in a microemulsion system.

MATERIALS AND METHODS

All the chemicals and reagents obtained and used are of analytical grade. chamomile oil and cedarwood oil and tween 80 were obtained. Ethanol was obtained.

Preparation of microemulsion

Using the phase titration approach, the oil in water microemulsion formulations were made5. Using ethanol as a co-surfactant, Tween 80 as a surfactant, chamomile and cedarwood oils as the oil phase, and deionized water as the aqueous phase, a number of microemulsion formulations were created. In a 3:1 ratio, a combination (Smix) of surfactant and co-surfactant was created. For both oils, various weight ratios of 1:9, 2:8, 3:7, 4:6, 5:5, 6:4, 7:3, 8:2, and 9:1 were obtained. These combinations were completely mixed using a magnetic stirrer after being stirred for two hours. After that, they were titrated with deionized water dropwise. Water titration was discontinued as soon as the turbid

mixtures transformed into a clear solution. The volumes of water added to every group were noticed and documented. After the produced microemulsion was submitted to further examination, the samples were kept for 48 hours for observation.

According to the composition listed in Table 1, nine distinct formulations of each oil were first created. After 48 hours, the formulation mixes were visually inspected for transparency. We only looked into transparent formulations in further detail.

EVALUATIONS

Visual observation

To verify the parameters, such as transparency and phase separation, visual inspection of the preparation was carried out. The formulations with no phase separation and improved clarity were chosen for additional examination.

Measurement of pH

A calibrated digital pH metre was used to measure the pH of the manufactured microemulsion formulations.

Electrical Conductivity

Using a digital conductivity metre, the compositions' electrical conductivity was assessed. Prior to measuring the conductivity of the formulations, the conductivity metre was first calibrated using purified water. mS/cm was used to calculate the electric conductivity.

Viscosity

A viscometer was used to measure the microemulsions' viscosity after they were manufactured.

Thermodynamic stability

Tests of thermodynamic stability were conducted in order to solve the metastable formulation issue.[6,7].

a) Centrifugation

To make sure the formulation was physically stable, it was centrifuged for 30 minutes at 3500 rpm.

b) Stress test

These experiments were conducted in order to determine the ideal microemulsion formulation for harsh environments. Six cycles of stress were conducted at 4 °C and 45 °C for 48 hours each, then for about three cycles at 25 °C and 21 °C for 48 hours each. Coalescence, cracking, and phase separation were examined in the samples.

Emulsion stability test

The kinetic stability of the microemulsion was determined by analysing the change in droplet size over the course of 24 hours, 7 days, and 28 days.

The microemulsion was centrifuged for 30 minutes at 3000 RPM. [8,9]

Staining test/dye-solubility test

Ten microliters of a methylene blue solution, a water-soluble dye, were added to the emulsion. Water (o/w emulsion) as the continuous phase will cause the dye to disperse evenly throughout the system. Should the continuous phase consist of oil without emulsion, the dye will persist as a cluster on the system's surface.

Table 1: Initial formulations with different oil and S_{MIX} ratio

S. no	Formulation code	Oil: Smix	Transparency
1	CWF1	9:1	Turbid
2	CWF2	8:2	Turbid
3	CWF3	7:3	Turbid
4	CWF4	6:4	Turbid
5	CWF5	5:5	Turbid
6	CWF6	4:6	Turbid
7	CWF7	3:7	Transparent
8	CWF8	2:8	Transparent
9	CWF9	1:9	Transparent
10	CF1	9:1	Turbid
11	CF2	8:2	Turbid
12	CF3	7:3	Turbid
13	CF4	6:4	Turbid
14	CF5	5:5	Turbid
15	CF6	4:6	Transparent
16	CF7	3:7	Transparent
17	CF8	2:8	Transparent
18	CF9	1:9	Transparent

Table 2: Final formulations selected for the further evaluation

S. no	Formulation Code	Transparency
1	CF7	Transparent
2	CF8	Transparent
3	CF9	Transparent
4	CWF6	Transparent
5	CWF7	Transparent
6	CWF8	Transparent
7	CWF9	Transparent

Table 3: PH, viscosity and conductivity of the selected formulations

S. No	Formulation code	pH	Viscosity (mPa.s)	Conductivity(mS/cm)
1	CWF6	4.9	0.792	0.141
2	CWF7	4.8	0.795	0.141
3	CWF8	5.3	0.794	0.164
4	CWF9	5.2	0.796	0.144
5	CF7	6.1	0.797	0.149

6	CF8	6.2	0.795	0.149
7	CF9	5.9	0.795	0.164

Table 4: Stability of the prepared formulations at 24hr, 7 days and 28 days

S. no	Formulation code	24 hours	7 days	28 days
1	CF7	Stable	Stable	Unstable
2	CF8	Stable	Stable	Stable
3	CF9	Stable	Stable	Stable
4	CWF6	Stable	Stable	Unstable
5	CWF7	Stable	Stable	Stable
6	CWF8	Stable	Stable	Stable
7	CWF9	Stable	Stable	Stable

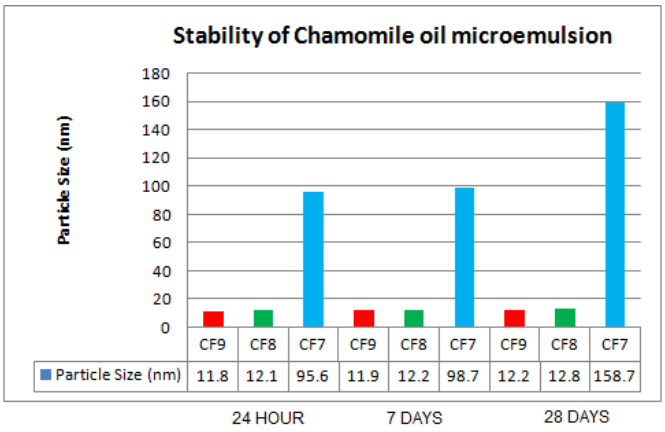

Figure 1: Stability of Chamomile oil microemulsion

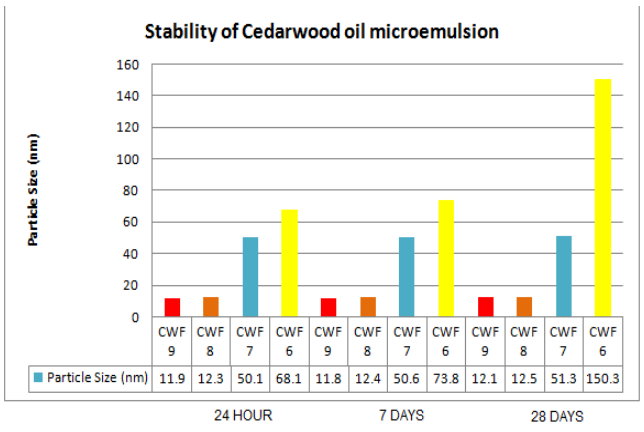

Figure 2: Stability of cedarwood oil microemulsion

RESULTS AND DISCUSSION

When visually inspected, four formulations of cedarwood oil and three formulations of chamomile oil revealed a transparent, clear combination based on the transparency of the created formulations. As the surfactant concentration rose, transparency rose as well. Therefore, these clear formulations for chamomile oil (CF7, CF8, and CF9) and cedarwood oil (CWF6, CWF7, CWF8, and CWF9) were taken into consideration for additional analysis (Table 2).

Table 4 displays the measured values for pH, viscosity, and conductivity of the chosen formulations. Once centrifuged at 3000 RPM, no evidence of phase separation was seen. As seen in table 4, kinetic stability was also attained over a 28-day period, and it was discovered that CWF6 and CF7 were not stable for an extended amount of time. The variations in the particle sizes of CWF6 and CF7 over time are evident in Figures 1 and 2.

Based on the acquired data, it can be confirmed that the kinetic stability was developed throughout the course of 28 days and that the stability was maintained for the full 28 days.

CONCLUSION

The current situation necessitates more conspicuous and expert medication delivery to the targeted

location of action. Because of its stability and physical characteristics, microemulsion has become more and more important as a unique technique. This study's utilisation of a unique method to deliver pharmacologically active natural oils may undoubtedly set up the groundwork for future research, which will hopefully result in the simultaneous development of a commercial formulation soon.

ACKNOWLEDGEMENT

The authors are grateful to Faculty of Pharmacy, Oriental University, Indore for providing the necessary facilities to carry out the research work.

REFERENCES

1. Fanun M. Formulation and characterization of microemulsions based on mixed nonionic surfactants and peppermint oil. Journal of Colloid and Interface Science 2010; 343(2): 496-503.
2. Goswami P, Choudhury A, Dey BK. Microemulsion – A Potential Carrier for Improved Bioavailability. International Journal of Pharmaceutical & Biological Archives 2019; 10(2): 69-77.
3. Rogerio AP, Andrade EL, Leite DFP, Figueiredo CP, Calixto JB. Preventive and therapeutic antiinflammatory properties of the sesquiterpene α-humulene in experimental airways allergic inflammation. British Journal ofPharmacology 2009; 158(4): 1074-87.
4. Balakrishnan A. Therapeutic uses of peppermint-a review. Journal of Pharmaceutical Sciences and Research 2015; 7(7): 474.
5. Jha SK, Karki R, Venkatesh DP, Geethalakshami A. Formulation development & characterization of microemulsion drug delivery systems containing antiulcer drug. International Journal Drug Development and Research 2011; 3(4): 336-43.
6. M Joyce Nirmala, N Chandrasekaran, Amitava Mukherjee. Enhanced solubilization of aqueous insoluble anti-hypertensive drug. Int J Pharm Pharm Sci 2012;4:366-8.
7. Divya A, Ch Praveen Kumar, K Gnanaprakash, M Gobinath. Design, formulation and characterization of tenofovir microemulsion as oral drug delivery. Int J Pharm Rev Res 2014;4:1-5.
8. Barakoti H, Choudhury A, Dey BK. An Outlook for a Novel Approach: Self-Micro Emulsifying Drug Delivery System (SMEDDS). Research Journal of Pharmacy and Technology 2019; 12(4): 2055-64.
9. Ghosh PK, Murthy RSR. Microemulsion potential drug delivery system. Current Drug Delivery 2006; 3(2):167-80.