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FORMULATION DEVELOPMENT AND EVALUATION OF COSMETIC EMULGEL FOR SKIN SOOTHING APPLICATION

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ABSTRACT

The present study focuses on the formulation development and evaluation of a cosmetic emulgel designed for skin-soothing applications. Emulgels combine the advantages of both emulsions and gels, offering improved stability, enhanced drug delivery, and better patient compliance. In this work, a soothing emulgel was formulated using suitable oil and aqueous phases containing skin-friendly ingredients such as moisturizing agents, emulsifiers, and gelling agents. The oil phase typically included emollients like liquid paraffin or natural oils, while the aqueous phase contained humectants such as glycerin and active soothing agents. Carbopol or similar polymers were used to prepare the gel base. The formulated emulgel was evaluated for various physicochemical parameters including appearance, pH, viscosity, spreadability, homogeneity, and stability. The pH was maintained within the skin-friendly range to avoid irritation. Viscosity and spreadability studies confirmed ease of application, while stability studies indicated no phase separation or degradation under different storage conditions. The formulation demonstrated good consistency, smooth texture, and effective soothing properties on application. Overall, the developed cosmetic emulgel proved to be a promising topical delivery system for skin soothing, combining aesthetic appeal with functional performance.

KEYWORDS: Emulgel, Skin soothing, Cosmetic formulation, Carbopol, Stability evaluation.

INTRODUCTION

After hair removal procedures such as waxing, the skin often experiences irritation, redness, inflammation, and dryness due to mechanical stress on the skin surface. In several cases, the skin becomes sensitive and may also exhibit a burning sensation, leading to discomfort. Considering these common post-waxing concerns, the present work focuses on the development of a herbal emulgel intended for soothing and protecting the skin. The formulation is designed to provide effective relief while promoting skin recovery through the use of natural ingredients possessing anti-inflammatory and antioxidant properties. Thus, the selection of an appropriate topical drug delivery system such as an emulgel ensures improved penetration, stability, and patient compliance.

Topical drug delivery implies the application of a drug-containing formulation to treat the skin infection on the surface of the skin directly. Gel formulations typically offer faster medication release than traditional ointments and lotions. Topical channels such as the skin, rectal, vaginal, and ophthalmic are utilized to deliver drugs for localized action on the body. Emulgels are created to overcome the fundamental constraint of gels, which is the difficulty in delivering hydrophobic medications. Emulgels are emulsions of the oil-in-water or water-in-oil variety that have been combined with a gelling agent to form a gel. The most reliable and effective delivery system for hydrophobic or poorly water-soluble medicines is emulsified gel. In simple terms, Emulgels are the fusion of an emulsion and a gel. Emulgels are typically utilised when other drug delivery methods fall short in their ability to effectively treat the skin conditions such as bacterial and fungal infections, acne, psoriasis, etc.[1-3]

In recent times, there has been great interest towards the use of novel polymers which can used as emulsifiers and

thickeners and the gelling capacity of these compounds is more and allows the formulation of stable emulsions and creams. This act by increasing the viscosity of the aqueous phase and at the same time decreasing surface and interfacial tension. Due to the presence of a gelling agent in the water phase converts a classical emulsion into an emulgel. These Emulgels for Topical uses have the various useful properties like being thixotropic, bio-friendly, water-soluble, greaseless, easily spreadable, emollient, easily removable, non- staining, greater shelf life, clear & pleasant appearance.[4,5]

Penetration of Drug through Human Skin

The skin is the largest organ of the body, with a total area of about 20 square feet. The skin protects us from microbes and the elements, helps regulate body temperature, and permits the sensations of touch, heat, and cold.

Skin has three layers.

- Waterproof barrier and creates our skin tone.
- The dermis, beneath the epidermis, contains tough connective tissue, hair follicles, and sweat glands.
- The tissue deeper subcutaneous (hypodermis) is made of fat and connective tissue.

Penetration pathways

There are three penetration pathways available for topically applied drugs.

- Intercellular
- Follicular
- Transcellular

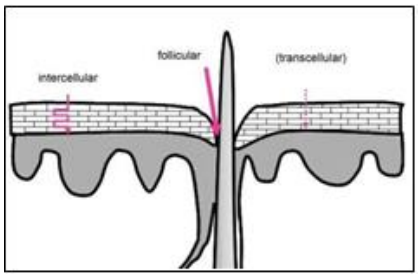

Figure 1: Schematic drawing showing the skin surface interrupted by a follicular orifice and demonstrating the three possible penetration pathways for topically applied substances through the skin barrier.

Intercellular: It is defined as the transport of drugs through junction between the epithelial cells.
Intracellular: It is defined as passage of drugs across the epithelial cells.
Follicular: Here the hair follicle acts as a pathway for penetration of topically applied drugs.[6-9]

EMULGEL: Emulsion + Gel

Emulgels combine gel and emulsion benefits as controlled topical drug delivery systems. They are o/w or w/o emulsions gelled with a gelling agent. Gels provide mucoadhesion for prolonged skin contact; o/w for washability, w/o for dry skin emolliency. Less thixotropic emulsions aid penetration; gelling boosts emulsion stability and stratum corneumpermeation. Gels outperform creams/ointments in dermatological ease and stability. For BCS Class II drugs (low solubility, high permeability), emulgels overcome dissolution limits, serving as stable vehicles for hydrophobic drugs.[10]

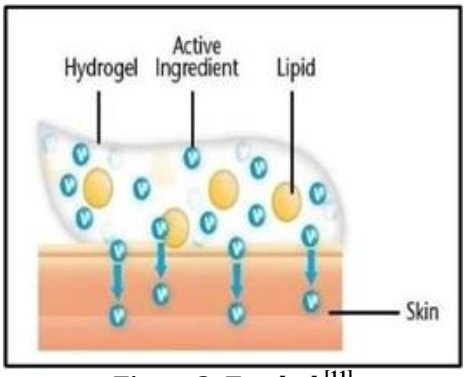

Figure 2: Emulgel.[11]

TYPES OF EMULGELS

1. Based on the Type of API
2. Based on the type of emulsion

Based on the Type of API

- **Herbal/poly-herbal**

Example:

i. Cosmetic Emulgel for skin care from field pumpkin.
ii. Anti-psoriatic Emulgel from babchi oil and Gum Guggle.

- **Allopathic**

Example

i. Diclofenac diethyl Ammonium Emulgel (VOLTAREN) by NOVARTIS PHARMA.

Based on the type of Emulsion

- **Macroemulgel:** Size of dispersed phase droplets more than 400nm and prepared by High Energy and Low Energy Method.
- **Microemulgel:** Droplet Size Between 1nm to100nm. Prepared by Phase Inversion And Phase Titration Method.
- **Nanoemulgel:** Droplet size is less than 1nm.

Advantages & Disadvantages of emulgel[12-14]

Advantages	• Incorporation of hydrophobic drugs. • Improved stability. • Controlled drug release. • Non-greasy / good patient compliance. • Easy production & low cost. • Better drug loading capacity.
Disadvantages	• Poor absorption for large particle size drugs. • Some drugs show low skin permeability. • Risk of skin irritation or allergic reaction. • Formation of air bubbles during preparation. • Possible instability (phase separation). • Requires careful formulation technique

Factors Affecting Topical Absorption of Drug.[15-16]

1. Physiological factors	2. Physicochemical factors
Skin thickness	Partition coefficient
Lipid content	Molecular weight (<400 Dalton)
Density od hair follicles	Degree of ionization (Unionized drugs absorb better)
Density of sweat glands	Effect of vehicle
Skin pH	
Blood flow	
hydration of skin	
inflammation of skin	

The rationale of emulgel as topical drug delivery

Various semisolids and other preparations are available on the market for restoring the skin's fundamental role or pharmacologically altering an operation to the underline tissue. The formulations, such as lotions, ointments and creams have several drawbacks, including being sticky, having a low spreading coefficient, and having stability issues. Only transparent gels have exposure in pharmaceutical and cosmetic preparations due to overall limitations within the semisolid preparations. As a result, an emulsion-based solution is used to address this limitation. Hence, the hydrophobic moiety of the drug should be incorporated and provided through gels. Drug/oil/water emulsions may be used to integrate hydrophobic drugs into emulgel. Since solubility acts as a barrier, most drugs cannot be inserted directly into gel bases, causing problems during drug release. The emulgel system helps to incorporate a hydrophobic drug into the oil phase, after which oily globules are easily dispersed into the aqueous phase, resulting in an oil/water emulsion. The emulsion can be mixed into the gel base. This may result in enhanced drug stability and release over simply incorporating the drug into the gel base.[17-18]

METHODS AND MATERIALS

Methods

1. Maceration Process of Amla Leaves (*Emblica officinalis*) Sample Preparation

Fresh leaves of *Emblica officinalis* were collected, washed thoroughly with distilled water to remove dirt and impurities. Leaves were shade-dried and then ground into a coarse powder.

Figure 3: Amla Leaves Powder.

Maceration Procedure

1. About 10 g of powdered Amla leaves was taken in a clean container.
2. It was soaked in 100 mL of solvent (distilled water / ethanol / hydroalcoholic solution 50:50).
3. The mixture was kept at room temperature for 5–7days with occasional stirring to ensure proper extraction of phytoconstituents.
4. After maceration, the mixture was filtered using muslin cloth or Whatman filter paper.
5. The filtrate was concentrated using a water bath or rotary evaporator at controlled temperature.
6. The dried extract was collected and stored in amber-colored containers for further use.[19-21]

Figure 4: Herbal Amla Extract.

2. Maceration Process of Brahmi Leaves (*Bacopa monnieri*) Sample Preparation

Fresh leaves of *Bacopa monnieri* were collected and washed with distilled water. Leaves were shade-dried and pulverized into coarse powder.

Figure 5: Brahmi Leaves Powder.

Maceration Procedure

1. Approximately 10 g of Brahmi leaf powder was taken in a container.
2. The powder was macerated with 100 mL of solvent (distilled water/ ethanol / hydroalcoholic mixture 50:50).
3. The mixture was allowed to stand for 5-7 days at room temperature with intermittent shaking or stirring.
4. After extraction, the mixture was filtered.
5. The filtrate was evaporated using a water bath or rotary evaporator to obtain a concentrated extract.
6. The dried extract was stored in airtight amber containers.[22-24]

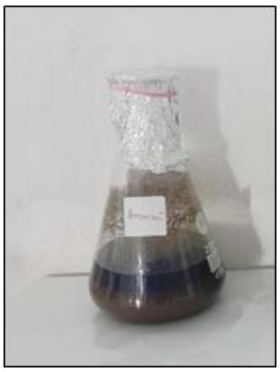

Figure 6: Herbal Brahmi Extract.

Method of Preparation

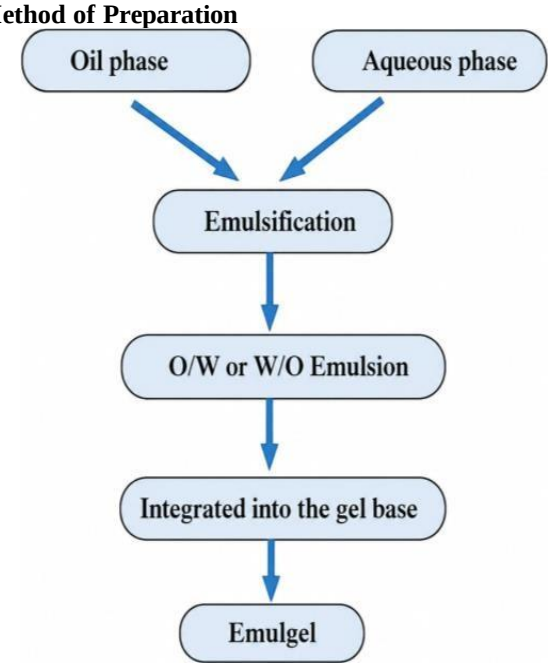

Figure 7: Method of Preparation of Emulgel.

Step 1: Preparation of Gel Base

Take purified water and slowly disperse Carbopol 934 with continuous stirring. Allow it to hydrate properly (30–60 min). Adjust pH to 6–6.5 using Triethanolamine to form a clear gel.

Step 2: Preparation of Emulsion

Oil Phase

Dissolve Castor oil and span 80 and add rose oil in suitable container and heat the mixture to 70–80°C

Aqueous Phase

Dissolve tween 20, boric acid, zinc oxide, urea, xanthum gum, herbal extract (amla, brahmi) and sodium citrate in sufficient amount of water.

Step 3: Preparation of Emulgel

Mix prepared emulsion with gel base in 1:1 ratio. Stir continuously until a uniform emulgel is obtained.[25,26]

FORMULATION TABLE

Table 1: Ingredients for formulation of Cosmetic Emulgel.

Sr. No.	Ingredients	F_1	F_2	F_3	F_4	F_5
1	Herbal extract	2 ml	2 ml	**2 ml**	2 ml	2 ml
2	Boric acid	0.3 g	0.3 g	**0.3 g**	0.3 g	0.3 g
3	Zinc oxide	1.5 g	1.5 g	1.5 g	1.5 g	1.5 g
4	Urea	1.5 g	1.5 g	1.5 g	1.5 g	1.5 g
5	Glycerine	1.5 ml	1.5 ml	1.5 ml	1.5 ml	1.5 ml
6	Sodium citrate	0.15 g	0.15 g	0.15 g	0.15 g	0.15 g
7	Castor oil	0.3 ml	0.3 ml	0.3 ml	0.3 ml	0.3 ml
8	Rose oil	-	-	**1-2 drops**	1-2 drops	1-2 drops
9	Carbopol 394	0.4 g	0.3 g	**0.3 g**	0.2 g	0.3 g
10	Xanthan gum	0.2 g	0.3 g	**0.3 g**	0.3 g	0.3 g
11	Tween 20	0.4 ml	0.4 ml	**0.4 ml**	0.3 ml	0.3 ml
12	Span 80	0.2 ml	0.3 ml	**0.4 ml**	0.3 ml	0.3 ml
13	Triethanolamine	2-3 drops	2-3 drops	**2-3 drops**	2-3 drops	2-3 drops
14	Water	q.s	q.s	**q.s**	q.s	q.s

Figure 8: Shows the formulation which we have prepared in our lab.

EVALUATION OF THE EMULGEL

1. Physical examination

The prepared emulgel formulations were visually assessed for color, uniformity, texture and phase separation.[27,28] The results are recorded.

2. Determination of pH value

In, the pH value of the preparation led to the decision to use a virtual pH meter. The electrode of the pH meter is washed with distilled water, then the preparation is immersed to measure the pH and this process is repeated three times.[28-29]

The pH of the emulgel formulation were recorded. The emulgel formulated in the work was pH value is 5.74, which is close to neutral pH. This was recorded.

Figure 9: Digital pH Analysis of Herbal Emulgel (Formulation F3).

3. Spreadability test

The spreadability test of the sample was determined using the following method: the prepared cream was applied between the two glass slides and compressed between the two glass slides to a uniform thickness by placing 500 ± 1 g of weight for 5 min. Then, weight was added to the weighing pan.34 The value of Spreadability was calculated through the following equation

Spreadability= (W×L)/T Where,

W: Weight tight to the upper slide L: Length moved on

the glass slide
T: Time taken in seconds[30]
The spreadability of emulgel was 2.8 cm (easily spreadable)

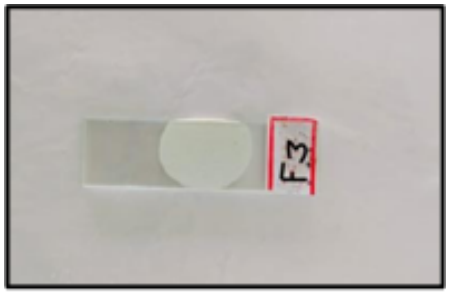

Figure 10: Spreadability Assessment of Herbal Emulgel Using Glass Slide Method.

4. Patch Test/Sensitivity test

Human volunteers (n = 3) were selected for patch test. Formulation (1 g) was applied on the forearm of the volunteers in the form of bandage disc and then covered with surgical dressing. After 24 h, the patches were removed and the areas were washed with saline fluids. The volunteers were asked for any irritation and the areas of application were observed for the presence/absence of edema and erythema (redness of skin).[31]

5. Centrifugation study

This procedure is used to determine the emulgel's stability. After a week of preparation, it is completed. The experiment was carried out in a minicentrifuge at 3000 rpm for 30 minutes. The presence or absence of phase separation was observed.[32]

Figure 11: Evaluation of Physical Stability of Emulsion System.

RESULT

Evaluation Parameters of Cosmetic Emulgel

Table 2: Evaluation Parameters of Cosmetic Emulgel.

S.no.	Test	F_1	F_2	F_3	F_4	F_5
1	Appearance	Smooth	Smooth	**Smooth**	Smooth	Smooth
2	Color	Milky white	Milky white	**Milky white**	Milky white	Milky white
3	Odour	Characteristic	Characteristic	**Pleasant**	Pleasant	Pleasant
4	Wash-ability	Washable	Washable	**Washable**	Washable	Washable

Viscosity

The viscosity of the emulgel was measured using a Brookfield viscometer (DV-E VSCOMETER). The emulgel was weighed 50 gm. The emulgel was put into a measuring container and the spindle of the Brookfield viscometer was dipped into the formulation then measured the viscosity by using spindle no.6 at 30rpm.[33]

Figure 12: Determination of Viscosity of Prepared Herbal Emulgel (F3).

6. Homogeneity

After the generated gels were placed in the container, they were all visually inspected for homogeneity. They had examinations to check for aggregates and to see how they looked.[34]

Figure 13: Formation of Homogeneous.

5	pH	5.56	6.29	**5.74**	6.39	6.07
6	Viscosity	17769	31072	**38517**	43000	45654
7	Spreadability test	2.1	2.5	**2.8**	2.6	2.3
8	Stability test	Stable	Stable	**Stable**	Stable	Stable
9	Homogeneity	Homogeneous	Homogeneous	**Homogeneous**	Homogeneous	Homogeneous
10	Skin irritation test	No irritation	No irritation	**No irritation**	No irritation	No irritation

DISCUSSION

The present study focused on the formulation and evaluation of a herbal cosmetic emulgel intended for post-wax skin soothing application. All the prepared formulations (F1–F5) showed satisfactory physicochemical characteristics including smooth appearance, homogeneity, good washability, and absence of phase separation, indicating successful formulation of the emulgel system.

The pH of all formulations was found within the range of normal skin pH, suggesting suitability for topical application without causing irritation. Viscosity studies revealed that an increase in polymer concentration enhanced the viscosity of the formulation, which subsequently influenced spreadability. An optimum balance between viscosity and spreadability is important for easy application and patient compliance.

Among all formulations, **F_3** showed optimum viscosity, good spreadability, pleasant odour, acceptable pH, and satisfactory stability, indicating better overall performance compared to other batches. Stability studies confirmed that the prepared emulgels remained physically stable without any sign of phase separation after centrifugation.

The herbal extracts of Amla (*Emblica officinalis*) and Brahmi (*Bacopa monnieri*) contributed beneficial antioxidant, zsoothing, and anti-inflammatory properties which may help in reducing redness, irritation, and discomfort associated with waxing. Furthermore, the absence of erythema and edema during patch testing confirmed the dermatological safety of the prepared formulation.

Thus, the developed herbal emulgel may serve as a promising and patient-friendly topical formulation for post-wax skin soothing application.

CONCLUSION

The present work successfully formulated and evaluated a herbal cosmetic emulgel for post- wax skin soothing application. All formulations exhibited satisfactory physicochemical properties, good homogeneity, stability, spreadability, and skin compatibility.

Among the prepared batches, formulation F3 was identified as the optimized formulation based on its suitable pH, viscosity, spreadability, stability, and pleasant aesthetic characteristics. The incorporation of herbal extracts such as Amla and Brahmi enhanced the soothing and protective properties of the formulation.

The developed herbal emulgel may serve as a safe, stable, and effective alternative to conventional post-wax soothing preparations. However, further long-term stability studies and clinical evaluations are recommended to establish its therapeutic effectiveness and commercial applicability.

REFERENCES

1. Vijayanta D, Disha D, Shaktipal P. Emulgel: a comprehensive review for novel topical drug delivery system. IJRSR. 2020; 11(4): 38134-38138.
2. Meenakshi D. Emulgel: a novel approach to topical drug delivery. Int. J. Pharm. Bio. Sci., 2013; 4(1): 847-856.
3. Gopalasatheeskumar K, Komala S, Soundarya R, Parthiban S, DivyaBharathi B, Elango S. Review on emulgel formulations with non-steroidal anti-inflammatory drug. Int. J. Pharm., 2017; 8(1): 238-254.
4. SUNILKUMARYADAV et al, International Journal of Current Pharmaceutical Research, EMULGEL: A NEW APPROACH FOR ENHANCED TOPICAL DRUG DELIVERY, 2017; 9(1).
5. KalpeshAshara et al- Journal of Pakistan Association of Dermatologists.Emulgel: A novel drug delivery system, 2016; 26(3): 244-249.
6. Joseph R. Controlled drug delivery fundamentals and applications. 2nd ed. Informa health care.
7. http://www.webmed.com
8. Jürgen Lademann, Alexa Patzelt. Analysis of the penetration of topically applied substances through the skin barrier 2013. Basf skin care forum.
9. Brahmankar DM. Biopharmaceutics and pharmacokinetics prakashan.10-11.
10. Ajazuddin, Alexenderamit, KhichariyaAjita, Gupta Saurabh, PatelRavish.J, Giri Kumar Tapan, Tripathi Krishna Dulal. Recent expansion in an emergent novel drug delivery technology: Emulgel. J Control Release 2013; 171: 122-132.
11. Ritika Arora, Rukhsar Khan, AnupOjha, KumudUpadhyaya, Himansu Chopra, Emulgel: A Novel Approach For Hydrophobic Drugs, Int. J. Pharm. Biol. Sci., 2017; 7(3): 43-60.
12. RachitKhullar, Saini S, Seth N, Rana AC. Emulgels: A Surrogate Approach for Topically used Hydrophobic Drugs. International Journal of Pharmacy and Biological Sciences. 2011; 1(3): 117-128.
13. A.S. Panwar, S. Gandhi, A. Sharma, N. Upadhyay, M. Bairagi, S. Gujar, G.N. Darwhekar, D. K. Jain.

Emulgel: A Review. Asian Journal of Pharmacy and Life Sciences. 2011; 1(3): 333-343.
14. Shailaja Pant, AshutoshBadola, SwetaBaluni and Warsha Pant. A Review on Emulgel Novel Approach for Topical Drug Delivery System. World Journal of Pharmacy and Pharmaceutical Sciences. 2015; 4(10): 1728-1743.
15. Kalia YN, Guy RH. Modeling transdermal drug release. Adv. Drug. Deliv. Rev., 2001; 48: 159-72.
16. Ayub, CA, Gomes ADM, Lima MVC, Vianna-Soares CD, FerreiraLMA. TopicalDelivery of Fluconazole: In Vitro Skin Penetration and Permeation Using Emulsions as Dosage Forms Drug. Dev. Ind. Pharm., 2007; 33: 273- 280.
17. Khare S, Abyankar S. Kuchekar A, Gawade A, A Mini Review – Pharmaceutical Creams, SchAcad. J. Pharm., 2021; 10 (04): 60-62.
18. Dhawas V, Dhabarde D, Patil S, Emulgel: A Comprehensive Review for Novel Topical Drug Delivery System, International Journal of Recent Scientific Research, 2020; 11(04): 38135-38136.
19. Kokate, C.K., Purohit, A.P., Gokhale, S.B. Pharmacognosy, Nirali Prakashan.
20. Harborne, J.B. (1998). Phytochemical Methods.
21. Indian Pharmacopoeia (IP), herbal monographs.
22. Khandelwal, K.R. Practical Pharmacognosy Techniques and Experiments.
23. Evans, W.C. Trease and Evans Pharmacognosy.
24. WHO Guidelines on Good Agricultural and Collection Practices (GACP) for medicinal plants.
25. Rieger MM, Lachman L, Lieberman HA, Kanig JL. The Theory and Practice of Industrial Pharmacy. 3rd ed. Philadelphia, PA: Lea and Febiger; 1986; 502-33.
26. Sathe S, Bagade M, Nandgude T, Kore K, Shete R. Formulation and evaluation of thermo reversible in-situ nasal gel of terbutaline sulphate. Indo. Am. J. Pharm. Res., 2015; 5: 3680-7.
27. Yadav S, Mishra M, Tiwari A, Shukla A. Emulgel: A novel approach for enhanced topical drug delivery. Int. J. Curr. Pharm. Res., 2017; 9: 15-9. DOI: https://doi.org/10.22159/ijcpr.2017v9i1.16628
28. Nandgude T, Thube R, Jaiswal N, Deshmukh P, Chatap V, Hire N. Formulation and evaluation of pH induced in-situ nasal gel of salbutamol sulphate. Int. J. Pharm. Sci. Nanotechnol., 2008; 1: 177-82. DOI:10.37285/ijpsn.2008.1.2.9
29. More S, Nandgude T, Poddar S. Vesicles as a tool for enhanced topical drug delivery. Asian J. Pharm., 2016; 10: S196-209.
30. C.K.N.D. Viviane, A.N.D. Regis, R.B. Mariana, et al. Physical chemistry evaluation of stability, spreadability, in vitro antioxidant, and photo-protective capacities of topical formulations containing calendula officinalis L. Leaf extract Braz. J. Pharm. Sci., 2015; 51: 63-75.
31. Rasul, A., Akhtar, N., Formulation and in vivo evaluation for anti-aging effects of an emulsion containing basil extract using non- invasive biophysical techniques. DARU. 2011; 19: 344–350.
32. Sreevidya V.S. "An overview on emulgel", International Journal of Pharmaceutical and Phytopharmacological Research, 2019; 9(1): 92-97.
33. Netto MPharm, G., & Jose, J. (2017). Development, characterization, and evaluation of sunscreen cream containing solid lipid nanoparticles of silymarin. Journal of Cosmetic Dermatology. doi:10.1111/jocd.12470
34. Banker. G. S. and Rhodes. C.T., Moderen Pharmaceutics, 2nd Edn., Marcel Dekker, inc, Madison avene. New York, 1990; 40: 303-307.