



DEVELOPMENT OF A TOPICAL HERBAL FORMULATION WITH HERBAL EXTRACT

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Abstract

They may be applied to the skin, placed on the surface of the eye or used nasally, vaginally or rectally. Topical preparations are used for both local and systemic effects. The following distinction is an important one with regard to dermatological applications. A topical dermatological product is designed to deliver drug into skin in treating dermal disorders with skin as target organ.¹ Dermatological products applied to the skin are diverse in formulation and range in consistency from liquids to solid powders, but most popular products are semisolid preparations. Some of these may be non-medicated, in the sense that these may be devoid of any therapeutically active ingredients and are used for cosmetic purposes.

Keyword:

Types Of Semi-Solid Dosage Forms, Evaluation, Materials And Methods,Formulation, Stability Study.

INTRODUCTION

Ointment, creams and gels are semisolid dosage forms intended for topical application. They may be applied to the skin, placed on the surface of the eye or used nasally, vaginally or rectally. Topical preparations are used for both local and systemic effects. The following distinction is an important one with regard to dermatological applications. A topical dermatological product is designed to deliver^[1].

drug into skin in treating dermal disorders with skin as target organ.¹ Dermatological products applied to the skin are diverse in formulation and range in consistency from liquids to solid powders, but most popular products are semisolid preparations. Some of these may be non-medicated, in the sense that these may be devoid of any therapeutically active ingredients^[2] and are used for cosmetic purposes^[2].

The physical and chemical behavior of the drug and the dosage form are important during preformulation studies, bench scale work, pilot studies and batch processing, at the manufacturing level during storage and use of a product. Some general factors must be considered during the development of new semisolid dosage forms and storage that includes stability of active ingredient, stability of adjuvant, rheological properties (consistency, viscoelasticity and extrudability), loss of volatiles including water, phase changes (homogeneity and cracking), particle size distribution of dispersed phase, pH and particulate contamination^[3].

The goals of preformulation studies are to establish necessary physicochemical parameters of new drug substance, physical characteristics and its compatibility with common excipients. Physicochemical studies are usually associated with greater precision and accuracy and in case of new drug substance these would include studies of pKa, solubility, melting point, polymorphism, vapor pressure, surface characteristics (surface area, particle shape, pore volume) and hygroscopicity^[4].

Prior to attempting the first formulation with a new drug, most research groups carry out compatibility testing, the principle is to make up reasonably mixtures of drug and excipient, to ascertain which excipients may be reasonably used with the drug. The methods used nowadays have followed in step with analytical developments^[5].

1. Types of semi-solid dosage forms

Ointments are homogeneous, semi-solid preparations intended for external application to the skin or mucous membranes. They are used as emollients or for the application of active ingredients to the skin for protective, therapeutic or prophylactic purposes and where a degree of occlusion is desired. Ointments are formulated using hydrophobic, hydrophilic or water-emulsifying bases to provide preparations that are immiscible, miscible or emulsifiable with skin secretions. They can also be derived from hydrocarbon (fatty), absorption, water-removable or water-soluble bases.

Creams are semisolid emulsion for external application. Oil in water emulsion is mostly used as water washable bases, whereas water-in-oil emulsions are emollient and for cleansing purposes. Creams find primary application in topical skin products. Many patients and physicians prefer cream to ointments because they are easier to spread and remove. Creams are emulsions for external use.

Gels are usually homogeneous, clear, semi-solid preparations consisting of a liquid phase within a three-dimensional polymeric matrix with physical or sometimes chemical cross-linkage by means of suitable gelling agents. The increased viscosity caused by the interlacing and consequential internal friction is responsible for semisolid state. Gel systems are as clear as water, grid others are turbid, since the ingredients may not be completely molecularly disperse (soluble or insoluble) or they may form aggregates which disperse light.

2. Evaluation of topical formulations

A good disperse system formulation should have both physical and chemical stability and cosmetic acceptability. Disperse systems can vary in appearance due to viscosity, gloss, smoothness and texture.⁵ Topical formulations are evaluated for viscosity, particle size distribution, electrical conductivity, texture analysis, extrudability, rheological studies, chemical evaluation and *in vitro* skin permeation studies.

3. Stability testing as per ICH guidelines

The aim of stability testing is to ensure quality, safety and efficacy of drug products upto their expiration date. This means that all organoleptic, physicochemical, chemical and microbial test results must be within the shelf life tolerance ranges upto the end of the shelf life. Stability of the pharmaceutical preparation can be defined as “the capacity of a particular formulation (dosage form or drug product) in a specific containers / closure system to remain within its physical, chemical, microbiological, therapeutic and toxicological specifications throughout their shelf life”.⁶ Stability testing has become an integral part of formulation development and also a part of dossier submission to regulatory agencies for licensing approval.

Factors affecting stability:

- 1) storage time
- 2) storage conditions
- 3) type of dosage form
- 4) container and closure system.

MATERIALS AND METHODS



Morinda Citrifolia Extract

1] Preparation of semi-solid formulations

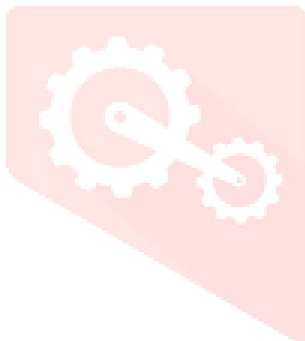
Semi solid formulations were prepared by standard methods as per the formulae given in Table 8.1. In each of these semi solid formulations, Ethyl acetate fraction was incorporated at 2.5 % w/w and 5 % w/w concentration.

Formulation

Sr. No	Ingredients	10%
1.	<i>Morinda Citrifolia</i> Extract	2 gm
2.	Nirgudi oil	2 ml
3.	Petroleum jeally	16 gm
4.	M.F Weight	20gm

Formulation

The composition of the ointment base with herbal hydroalcoholic extract has been shown in Table 11. *Morinda Citrifolia* extract and Aqueous phase was added to oily phase with stirring. The mixture was continuously stirred until the temperature reached 25°C. It was stirred continuously. Prepared formulations were then stored at the room temperature ($25 \pm 2^\circ\text{C}$) in a tightly closed collapsible tubes protected from light.



Evaluation parameters of the formulation

i. Appearance

The prepared formulations were inspected visually for their color, homogeneity and consistency.

ii. pH of the formulation

The pH of the prepared formulations was measured by taking 5 g of formulation in 50 ml of water. Then pH of this solution was determined with the help of Digital pH meter (systronics).7

iii. Determination of spreadability

One of the criteria for a cream, ointment or gel is that it should possess good spreadability. Spreadability is a term expressed to denote the extent of area to which the formulation readily spreads on application to skin or affected part. The therapeutic efficacy of a formulation also depends on its spreading value. Hence, determination of spreadability is very important in evaluating ointment characteristics. Special apparatus was designed to study the spreadability of ointment formulations. It was expressed in terms of time in seconds taken by two slides to slip off from the formulation, placed in between the slides under the direction of certain load. Lesser the time taken for separation of the two slides, better the spreadability.

Two sets of glass slides of standard dimensions were taken. The herbal formulation was placed over one of the slides. The other slide was placed on the top of the formulation, such that the formulation was sandwiched between the two slides in an area occupied by a distance of 6.0 cm along the slide. 100 g weight was placed upon the upper slides so that the formulation between the two slides was pressed uniformly to form a thin layer. The weight was removed and the excess of formulation adhering to the slides was scrapped off. The two slides in position were fixed to a stand without any disturbance and in such a way that only the upper slide to slip off freely by the force of weight tied to it. A 20 g weight was tied to the upper slide carefully. The time taken for the upper slide to travel the distance of 6.0 cm and separated away from the lower slide under the influence of the weight was noted.⁸ The experiment was repeated by three times and the mean time was taken for calculation.

Spreadability was calculated by using the following formula:

$$S = m \times l \times t$$

Where,

S - Spreadability

m - Weight tied to the upper slide

l - Length of the glass

t - Time taken in seconds

iv. Determination of extrudability

Extrudability test is the measure of the force required to extrude the material from a collapsible tube when certain amount of force has been applied on it in the form of weight. In the present study, the quantity in percentage of formulation extruded from the tube on application of certain load was determined. More the quantity extruded, better was extrudability of formulation.

A closed collapsible tube containing formulation was pressed firmly at the crimped end by keeping weight. When the cap was removed, formulation extruded until the pressure dissipated was noted. Weight in grams required to extrude a 0.5 cm ribbon of the formulation in 10 seconds was determined.⁹ The experiments were repeated thrice and the average value is reported.

v. Determination of viscosity

The measurement of viscosity of the formulations was done by using Brookfield Viscometer LVDV I (Spindle code S84) at 10 rpm.¹⁰

vi. Drug content

1 g of prepared formulations were weighed and dissolved in 100 ml methanol. They were filtered and necessary dilutions were made and the drug content was then determined spectrophotometrically.¹¹

Stability Study

Stability study was performed as per ICH guideline.¹³ The purpose of stability testing is to provide evidence on how the quality of a drug substance or drug product varies with time under the influence of a variety of environmental factors such as temperature, humidity and light. Therefore, stability studies provide data to justify the storage condition and shelf-life of the drug product. For drug substance, such studies establish the retest date in addition to the storage condition of raw material.

Stability studies were performed for selected formulation with $25 \pm 2^\circ \text{C}$ and $60 \pm 5\% \text{RH}$ and $40 \pm 2^\circ \text{C}$ and $75 \pm 5\% \text{RH}$ conditions for 6 months. The samples were analyzed at 0, 3 and 6 months interval for colour, physical appearance and pH.

Result & Discussion

Evaluation of formulation

The physical parameter such as color and appearance were observed for herbal formulations. The color of prepared formulation was Brown and also it was smooth on application. The pH value of formulations were studied using digital pH meter and it was found to be in the range of 6.5 – 6.8. herbal formulations showed a desirable pH quite similar to that of the skin pH.

Evaluation of topical formulation

Table No. 2.: Evaluation of formulation

Concentration of extract	Colour	Appearance	PH	Viscosity (cps)	Spreadability (g.cm/s)
10%	Yellow	Homogeneous	6.8	23340 ± 56	28 ± 2.4

Data represented as mean \pm SD, n=2

The viscosity of formulations was recorded. The viscosity of 5% and 10% was found to be 23600 and 23340 centipoises respectively which indicated that the formulations are easily spreadable by small amounts of shear and better spreadable property than other formulations.

Stability testing of herbal formulation

Table No. 3 : Stability testing of formulation

Storage conditions $25^{\circ} \pm 2^{\circ}\text{C} / 65 \pm 5\%\text{RH}$

Formulations	Properties	1 month	2 month	3 Month
5%w/w	Colour	Brown	Brown	Brown
	Appearance	Homogeneous	Homogeneous	Homogeneous
	PH	6.5	6.2	6.1
10%w/w	Color	Brown	Brown	Brown
	Appearance	Homogeneous	Homogeneous	Homogeneous
	PH	6	6.4	6.2

Data represented as mean \pm SD, n=2

Stability testing Stability studies were performed for formulation 5% w/w and 10% w/w with $25 \pm 2^{\circ}\text{C} / 60 \pm 5\% \text{RH}$ conditions for 3 months. The results of stability studies are shown in Table 8.5. The samples were analyzed for 0 month, 3 months interval for colour, physical appearance and pH. It was found that they were homogenous in appearance and the pH values were identical to the initial formulation. At both experimental conditions, the formulations 5%w/w and 10%w/w were found to be stable.

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