

FORMULATION AND EVALUATION OF HERBAL HYDRO GEL FROM *HIBISCUS ROSA-SINENSIS*

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Received: 26 October 2013, Revised and Accepted: 12 December 2013

ABSTRACT

Novel drug delivery systems generally approaches with the formulations, technologies and related systems for transporting the specific active ingredients to the systemic circulation. In this context a technique was employed for the formulation of herbal gel by using *Hibiscus rosa-sinensis*. The plant is commonly referred as Chinese hibiscus, which is widely grown as ornamental plant in tropical and subtropical regions of East Asia. It mainly contains active constituents like steroids, flavonoids, tannins, reducing sugar, mucilages, anthocyanin pigment, cyanodin diglucosides, carotene, thiamine, riboflavin, niacin and ascorbic acid. It is mainly used as antifertility, abortifacient, antiestrogenic, analgesic, anti-inflammatory, hepatoprotective and hair growth. Various formulations were prepared with different concentrations of the plant extract and it was evaluated for physical parameters, viscosity, Skin Irritation and Spreadability. Out of the three formulations the 20% was found to be better in all aspects. Thus it can be used as an alternative for the treatments and drug delivery systems.

INTRODUCTION

Transdermal drug delivery system is an electro-osmotic delivery system which helps in passing a drug from the systemic circulation to various part of body. It includes a semi-dry drug patch containing a water solute with the drug and selected level of current delivered to the semi dry patch. A multilaminar transdermal drug delivery system contains only drug in the drug reservoir which comprises a backing layer, reservoir layer which is dissolved completely. It is a device which provides an alternative route of administering the medication which allows pharmaceuticals to be delivered across the barriers (Ansel et al,20011). They are classified as Membrane permeation-controlled system, adhesive dispersion type and micro reservoir dissolution controlled systems.(D.sibalis-ep patient 0,282,92-1997 free patient.com). Transdermal formulations are-liquid preparation, Gels, Powder, ointment, creams, pastes, aerosols (Aulton). Thus the most convenient type was taken up for the research which can provide better results in terms of experiments. Gel is a solid, jelly like material that posses the properties ranging from soft and weak to hard and tough. Gel is defined as a substantially dilute cross linked system which exhibits no flow when in steady state. There are various type of gel which are classified as- Hydro gel are also known as aqua gel. It forms a network of polymer chains which are hydrophilic, and sometimes forms as a colloidal in which water is used as dispersion medium. It posses various uses like: acts as scaffolds in tissue engineering to repair tissue and also as a sustain release drug delivery system. The major advantages of using hydro gels is that they are used as simple encapsulation of cells or drugs in homogenous material. It has been observed that hydro gels are more complex, smart polymers with different types of ligands and cross linked which allows for higher regulation of structure and which reacts different to the bio responsive functionalities. They also help in the preparation of DNA vaccines which can treat the genetic disorders. Organo gels they are non-crystalline, non-glassy thermo-reversible(thermoplastic) solid material composed of a liquid organic phase entrapped in a 3-D cross network. The liquid can be in any form as organic solvent, material oil or vegetable oil. These are used in pharmaceutical products, cosmetic preparations, art conservation and in health food additives. The major advantages of organo gels are they form semisolid on standing of the preparations and also posses molecular electronics. But they also follow disadvantages like recovery is difficult which leads to improper purification of proteins. The next type is Xero gels. They are solid preparations which are generally dried or unhindered shrinkage. They usually retain high porosity (25 %) and enormous surface (150-900 m²/g) along with very small pore size (1-10nm). They are used in capsulation medium, as bimolecular probe substrates and also in techniques of enzyme immobilization. Thus a novel approach was undertaken for the making of hydro gel understanding its advantages with herbal drug.

The plant taken up for the research was *Hibiscus rosa-sinensis* L. *Hibiscus rosa sinensis* (Malvaceae) commonly known as China rose is a large genus of herbs, shrubs and trees widely distributed in the tropical and subtropical regions of the world. Out of 160 species, about 40 occur in India. Many *Hibiscus* species are valued as ornamental plants and are cultivated in gardens. *H. cannabinus* and *H. sabdariffa* are important sources of commercial fibre. Some species are useful as food, yet others are medicinal. It is widely grown as an ornamental plant which is spread throughout the tropical and subtropical regions. The flowers are large, red, firm, but lack any scent. Numerous cultivars, varieties, and hybrids have been created, with flower colours ranging from white through yellow and orange to scarlet and shades of pink, with both single and double sets of petals (Anonymous, 2001).

MATERIALS AND METHOD

Preparation of *Hibiscus rosa sinensis* extract: The plant was collected from the wild sources of Greater Noida. It was dried, powdered and extracted with solvents as per their polarity. For experimental work, hydroalcoholic extracts were prepared by maceration method. 500 g of the drug were weighed and separately it was mixed with water and alcohol in the ratio of 50:50. The whole process was kept in dark conditions for seven days with frequent shaking every 2 hours. After seven days the extract was filtered and the filtrate was concentrated by distilling of the solvent till one third. After that the extract was concentrated over water bath at a temperature not exceeding 60°C. The extract was further dried over desiccator for overnight and was used further for the experiments. The Hydroalcoholic extract (170 gm) were weighed respectively.

Table 1: Formula for gel preparation

Ingredients	Quantity Specified
Carbopol-934	1 g
Methyl paraben (0.5%)	Quantity Sufficient
Propyl Paraben (0.2%)	Quantity Sufficient
Propylene glycol-400	Quantity Sufficient
Triethanolamine (Quantity Sufficient)	1.2ml
Distilled water	Make up the volume to 100ml

Preparation of Gel

1 g of carbopol-934 was dispersed in 50 ml of distilled water with continuous stirring. 2 ml of distilled water was mixed with methyl paraben and propyl paraben. They were dissolved on a water bath with continuous string. The solution was cooled and propylene glycol 400 was added gradually to form a homogenous mass. Further hydroalcoholic extract of *Hibiscus rosa sinensis* (100 mg) was mixed to the above mixture and volume was made up to 100

ml by adding remaining part of distilled water. All the ingredients were mixed properly with carbopol 934 to form a smooth gel. Finally triethanolamine was added drop wise to the formulation for the adjustment of required pH of about 6.8-7, to form a gel of required consistency. Further different formulations were prepared with various percentage (10, 20 and 30%) of herbal extract.

Evaluation of Gel: The prepared gel was evaluated on the basis of following parameters like : Physical evaluation, measurement of pH, spreadability, viscosity, skin irritation, extrudability etc.

- 1- **Physical evaluation** - Physical parameters such as color and appearance will be checked.
- 2- **Measurement of pH** - pH of gel was measured with the help of pH meter.
- 3- **Spreadability** - Spreadability was determined by the apparatus which consist of wooden block, which was provided by the pulley at one end. By this method spreadability was measured on the basis of slip and gel characteristics of gel. An excess of gel (2 gm) was placed on the on glass slide. The gel was then sandwiched between this glass slide and another glass slide having the dimensions of fixed ground slide and provided with the hook. A 1 gm weighted was placed on the top of the two slides for 5mins to expel air and to provide the uniform film of the gel between two slides. Excess of gel was scrapped off from the edges. The top plate was then subjected to the pull of 80gms. With the help of string attached to the hook and time in seconds required by the top slides to cover a distance of 7.5cm can be noted. A shorter interval indicates better spreadability.

$$S = M \cdot L / T$$

Where,

S= Spreadability, M= Weight of pen tied to the upper slide, T= Time taken (sec) to separated slides completely from each other.

4- **Viscosity**- Viscosity of gel was measured by using Brookfield viscometer with spindle no. S 64.

5- **Skin irritation test** - Gel formulation prepared was applied to the skin and it was tested for the irritation or allergic reactions.

6- **Extrudability**-The gel formulation were filled in standard capped collapsible aluminium tubes and sealed by crimping to the end. The weight of tubes were recorded and the tubes were placed between two glass slides and were clamped. 500gm was placed over the slides and then the cap was removed. The amount of extruded gel was collected and weighed. The percent of extruded gel was calculated as

- When it is greater than 90% then extrudability is excellent.
- When it is greater than 80% then extrudability is good.
- When it is 70% then extrudability is fair.

RESULTS AND DISCUSSION

The physical parameters of formulation were compared on the basis of viscosity, color, appearance, pH, spreadability, skin irritation. These test were performed and their observations are listed in Table1 and Table2.

Table 2: Evaluation of HydroGel

Parameters	Results		
	10%	20%	30%
Color	Creamy white	Pale Cream	Light green
Appearance	Clear	Clear and transparent	Turbidity
pH	6.8	7.0	7.1
Spreadability	Non uniform	Good	Good
Skin irritation	No reaction	No reaction	Reactant
Extrudability	Good	Excellent	Fair
Viscosity	Excellent	Excellent	Good

Table 3: Viscosity Measurement table of 20% Herbal Gel

RPM	Spindle No.	Viscosity	Torque Value(%)
10	564	43560	72.8
20	564	25890	86.0
30	564	19400	99.3

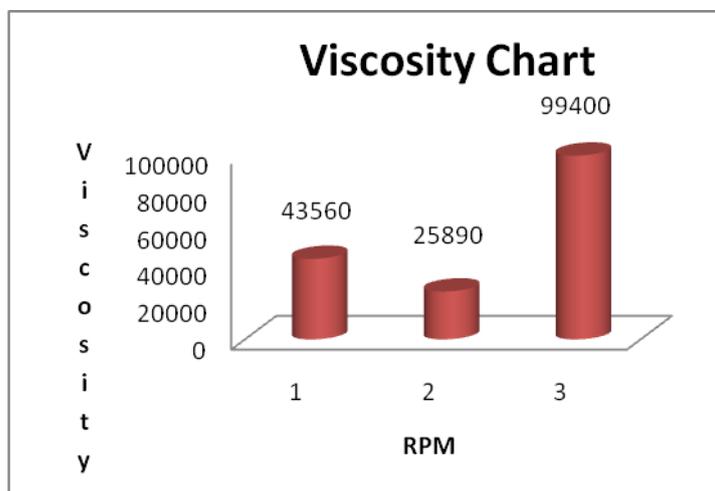


Fig. 1: Viscosity chart of 20 % prepared hydrogel of Hibiscus rosa sinensis

Out of the three formulations which were prepared, 20% was found to be more effective in terms of physical, viscosity, spreadibility etc. parameters. It was inferred from the results that the formulations which was prepared by gel in co-operation were found to be good in appearance as no sedimentation was observed. It was a clear, transparent preparation with a uniform homogenous mass as no lump formation was observed. The viscosity and spreadibility was found to be as per the limits prescribed by standard pharmacopoeias. Thus these preparations by use of herbal drugs leads to less expensive over the commercial available product. When it was compared with other two formulations (10 and 30%) few parameters like p^H , viscosity were not so significant. Thus it can be conferred that there is a growing demand for herbal cosmetics in the world market and they are invaluable gift of nature. Herbal medications are considered safer than allopathic medicines as allopathic medicines are associated with the side effects. One of the method for its survival is preparation of extract and their formulations for better absorption and penetration of the active moiety into the systemic circulation.

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