IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

DEVELOPMENT AND EVALUATION OF TURMERIC AND HORSEGRAM LOADED HYDROGEL FOR TOPICAL APPLICATION

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Abstract: Hydrogels are three-dimensional (3D) networks of hydrophilic polymers that can swell in water and retain a substantial amount of it. This property allows them to maintain their structure due to the chemical or physical cross-linking of individual polymer chains. This study aimed to develop and evaluate a turmeric hydrogel using specific hydrogel preparation methods. Turmeric was chosen for its well-known anti-inflammatory and antioxidant properties, making it a beneficial addition to skincare products.The objective of this research was to create a hydrogel that contains turmeric and horsegram assess its physicochemical characteristics, and ability to provide anti-acne and exfolitation benefits. Various excipients including gelling agents, humectants,pH adjuster,cleansing agent and preservative were selected and their concentrations were adjusted to achieve desired rheological properties.Physicochemical characterization of the formulated gel was performed using techniques such as viscosity measurements, pH determination, and spreadability test to ensure its suitability for topical application. In summary, this study's outcomes show that turmeric and horsegram loaded hydrogel can be successfully formulated with the desired stability and physicochemical qualities. Furthermore, the effectiveness research suggests that it could be a good skincare solution for anti acne and exfoliation of skin.

Keywords: Hydrogel ,turtmeric, horse gram ,exfoliation, anti-acne, anti-oxidant.

I. INTRODUCTION

A hydrogel is a biphasic material, a mixture of porous, permeable solids and at least 10% by weight or volume of interstitial fluid composed completely or mainly by water. Hydrogels are prepared using a variety of polymeric materials, which can be divided broadly into two categories according to their origin: natural or synthetic polymers.Hydrogel provides intensive hydration and deep nourishment to the skin. Curcumin research has revealed a wide range of intriguing biological and therapeutic functions, including anti-microbial, anti-cancer, anti-inflammatory, and anti-acne qualities.Curcumin, known chemically as diferuloylmethane or 1,7-bis(4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione, is a naturally occurring low molecular weight polyphenolic phytoconstituent. However, the therapeutic efficacy of curcumin is limited due to its poor solubility in aqueous media , poor oral bioavailability, and extensive fist pass metabolism. Horse gram (Macrotyloma uniflorum (Lam.) Verdc.) antioxidant potential and free radical-scavenging capacity of methanol and subsequently aqueous acetone extracts of the two varieties of raw and dry-heated horse gram seed samples.

AIM AND OBJECTIVES:

Aim:

The aim of the study is to develop and evaluate turmeric and horse gram loaded hydrogel for antiacne and exfoliation of the skin.

Objectives:

Development and evaluation of turmeric and horse gram hydrogel.

- Preparation of turmeric and horse gram hydrogel
- Evaluation studies of turmeric and horse gram hydrogel

II. METHODOLOGY

2.1 PROCEDURE:

Weighed required amount of methylparaben and carbopol and measured quantity of poly ethylene glycol, glycerin , triethanolamine was taken.Add Methyl paraben, glycerin, polyethylene glycol and 35ml of distilled water in to a beaker and were stirred at high speed using magnetic stirrer. Carbopol 934 was added slowly to the beaker and add triethanolamine
slowly for neutralize the solution (Mixture A).Weighed quantity of turmeric and horse gram were dissolved in a beaker(Mixture B). Mixture B added to Mixture A to get a hydrogel formulation of Turmeric and horse gramfor topical applicationThe exact concentration of each formula can be found in Table 1.

2.2 INGREDIENTS:

Table no. 1 : Ingredients and their working formula

SL NO	INGREDIENTS	WORKING FORMULA
1	Turmeric	0.5g
2	Horse gram	0.5g
3	Polyethylene glycol	2ml
4	Methyl paraben	0.08g
5	Carbopol 934	0.05g
6	Glycerin	3ml
7	Triethanolamine	1.2ml
8	Distilled water	qs

2.3 EVALUATION:

2.3.1 Appearance and consistency:

The physical appearance and consistency of formulation was visually checked for the texture of turmeric and horsegram loaded hydrogel.

2.3.2 pH measurement:

The pH of the transdermal gels were determined by digital pH meter. One gram of gel was dissolved in 25ml of distilled water and the electrode was then dipped in to gel formulation until constant reading obtained.And constant reading was noted. The measurements of pH of each formulation were replicated two times.

2.3.3 Spreadability:

Spreadability is expressed in terms of time in seconds taken by two slides to slip of from formulation, placed between, under the application of a certain load. Lesser the time taken for the separation of two slides, better the spreadability. The spreadability test was measured by spreading of 0.5 g of the gel on a circle of 2 cm diameter premarked on a glass plate and then a second glass plate was employed. Half kilogram of weight was permitted to rest on the upper glass plate for 5 min. The diameter of the circle after spreading of the gel was determined**.**

2.3.4 Viscosity::

The measurement of viscosity of the prepared gel was done using Brookfield digital Viscometer. The viscosity was measured using spindle no. 64 at 10 rpm and 250C.The sufficient quantity of gel was filled in appropriate wide mouth container. The gel was filled in the widemouth container in such way that it should sufficiently allow to dip the spindle of the Viscometer. Samples of the gels were allowed to settle over 30 min at the constant temperature (25±/10C) before the measurements.

2.3.5 Washability test:

Formulations were applied on the skin and then ease and extent of washing with water were checked manually.

2.3.6 Irritability test:

The bases used in the formulation of creams may cause irritation or allergic reactions. Irritancy of the preparation is evaluated by patch test . Mark an area on the left hand dorsal surface. The cream was applied to the specified area and the time was noted.

III. RESULT AND DISCUSSION

3.1 RESULT:

3.1.1 Physical Appearance and consistency:

FORMULATION	COLOUR	ODOUR	HOMOGENIEITY	TEXTURE
F1	Yellow	Characteristic odour	good	smooth
F2	Yellow	Characteristic odour	good	smooth
F3	Yellow	Characteristic odour	good	smooth
F4	Yellow	Characteristic odour	good	smooth
F5	Yellow	Characteristic odour	good	smooth

3.1.2 pH measurement:

Table no.3 : pH measurements of the formulation

Formulation	pH
F1	7.05
F2	6.99
F3	6.46
F4	6.39
F5	6.56

3.1.3 Spreadability:

Table no.4 : spreadability of the formulation

Formulation	Spreadability(cm/sec)
F1	6cm/s
F2	5.6cm/s
F3	5.8cm/s
F4	6.2cm/s
F5	6.5cm/s

3.1.4 Viscosity:

Table no.5 : viscosity of the formulation

Formulation	Viscosity(cP)
F1	1936
F2	1938
F3	1940
F4	1941
F5	1944

3.1.5 Washability:

Table no.6 : washability of formulation

Formulation	Washability
F1	Good
F2	Good
F3	Good
F4	Good
F5	Good

3.1.6 Irritability Test :

Table no.7 : Irritability of formulation

Formulaton	Irritability
F1	No irritancy
F2	No irritancy
F3	No irritancy
F4	No irritancy
F5	No irritancy

3.2 DISCUSSION:

3.2.1 Physical Appearance and consistency:

Physical appearance and consistency evaluation of turmeric and horsegram loaded hydrogel was determined. The colour was found to be yellow .The formulation exhibits smooth texture and good homogeneity and absorb well into the skin. The hydrogel has characteristic odour which enhance the users experience.

3.2.2 pH measurement:

Using the pH meter ,the pH of each formulation was checked and it was determined to be within the accepatable range. The Ph value of F5 was found to be 6.56,which is more suitable for the skin application.

3.2.3 Spreadability:

The spreadability test for the formulations was checked and F5 was having excellent spreadability. The measured spread diameter is in 6.5cm demonstrate good physical spreadability, confirming that the hydrogel can be applied without excessive effort.

3.2.4 Viscosity:

The viscosity test for the formulation was determined and found that there is increase in viscocity. The formulation F-5 has good viscocity.

3.2.5 Washability:

The washability evaluation test demonstrate that the product can be easily removed from the skin . This formulation exhibit excellent washability characteristics, ensuring that it can be conveniently removed without leaving any residue.

3.2.6 Skin irritation test:

The skin irritation test was performed and it was found to be non-irritant to skin. These findings confirm that the hydrogel is safe for regular use on all skin types.

IV. SUMMARY AND CONCLUSION

The primary objective of this study was to develop and evaluate turmeric and horse gram loaded hydrogel designed to deliver anti acne and skin exfoliation.Curcuma longa and its bioactive compounds possess numerous pharmacological activities such as anti-inflammatory,anti-arthritic, neuroprotective,anti-microbial ,wound healing and for acne prone skin been scientifically proven to providing essential structural support to the skin, thereby retaining its skin texture and bring out the glow. Its potent antioxidant properties effectively neutralize free radicals and exhibit anti-inflammatory characteristics. Horse gram is used to exfoliates the skin and removes the dead skin cells and it also act as an antioxidant.curcuma longa is less likely to induce side effects such as redness or peeling, ultimately reducing the appearance of wrinkles and fine lines.antioxident elements such as turmeric and horse gram plays a crucial role in replenishing moisture, enhancing skin texture, and maintaining optimal hydration levels. The hydrogel formulation ensures a intensive hydration and fast-absorbing product, suitable for oily and combination skin types, delivering hydration without any heaviness or greasiness.Through extensive investigation using five different formulations (F1, F2, F3, F4 and F5), it was concluded that F5 demonstrates exceptional spreadability, appearance, and homogeneity, and meets physical criteria such as texture, appearance, odor, color, and optimal pH. It is also best stored at room temperature for optimal results. In conclusion, this hydrogel formulation also provides superior hydration and anti-acne property.

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