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Research Article

Formulation And Evaluation of Hydrogel

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ABSTRACT

The present study deals with the development and characterization of Aloe Vera hydrogel preparation using the inner part of aloe vera leaf, carbapol 934, polyethylene glycol 400, triethanolamine, glycerin, methylparaben, orange oil, distilled water aloe vera pulp is converted into a liquid using the mixer and hydrogel is prepared by a simple dissolving method of other ingredients in a specific manner. Nine formulations were developed which differ in the ratio of hydrogel-forming polymer. All formulations were evaluated for physical evaluation, pH, Spreadability, % moisture content, antibacterial activity, washability, and viscosity. The formulation F6 was selected as the optimized formulation based on the evaluation parameter. based on the evaluation study, it can be concluded that Aloe vera hydrogel is a safe and effective treatment option used to manage skin-related diseases.

INTRODUCTION

One of the important medicinal plants is aloe vera. It is in greater demand and marketed in international medicinal medicine markets as a supplier of "aloin" (4.5 to 25 percent) and as a flavoring liquid [1]. Lotions containing aloe vera have been used by medical professionals to treat extensive thermal injuries such as frostbite and burns. Dentists use aloe vera gels to treat gum inflammation and swelling. Dermatologists treat acne with aloe vera products, while optometrists

utilize them to reduce inflammation in the eyes. Aloe vera is utilized by professional sports trainers to heal athletes' blisters, abrasions of the skin, and sprains. As aloe vera has such favorable effects, beauty companies add it to their makeup and skincare products. It's also done for marketing purposes. Aloe-vera tea made with honey is said to cure diabetes, ulcers, arthritis, and other conditions. Aloe vera, an ancient herb, is increasingly getting popular as it has numerous applications and beneficial effects [2, 3]. Aloe vera

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is a perennial succulent plant that is drought tolerant and belongs to the Asphodelaceae family with a long tradition of medicinal applications. The plant contains stiff, lance-shaped, grey-green leaves with a central mucilaginous pulp consisting of a clear gel. Clinical examinations have demonstrated that the rind and gel of the leaf of aloe vera contain most of the plant's pharmacologically active constituents. They have been shown to have analgesic and anti-inflammatory activity. Of the 300 (or more) varieties of aloe vera that exist across the globe, the true aloe vera plant is called *Aloe barbadensis* Miller, also known as the Curacao aloe, and is most medicinally active [4,5]. Because of its general use in beauty products, aloe vera is now familiar to most people in the UK. The plant has been described as "the wand of heaven," "heaven's blessing," and "the silent healer" throughout history [6,7]. There are a number of aloe vera herbal products available on the market in the form of creams, gels, face solutions, moisturizers, and others; however, the concentration of aloe vera

extract and herbal ingredients in these products is quite limited. Also, these products may contain dangerous chemicals such as surfactants. The present research aims to develop an aloe vera cosmetic herbal hydrogel formulation, or cosmetic facial, with a higher concentration of herbal and aloe vera leaf extract [8,9].

MATERIAL AND METHODS

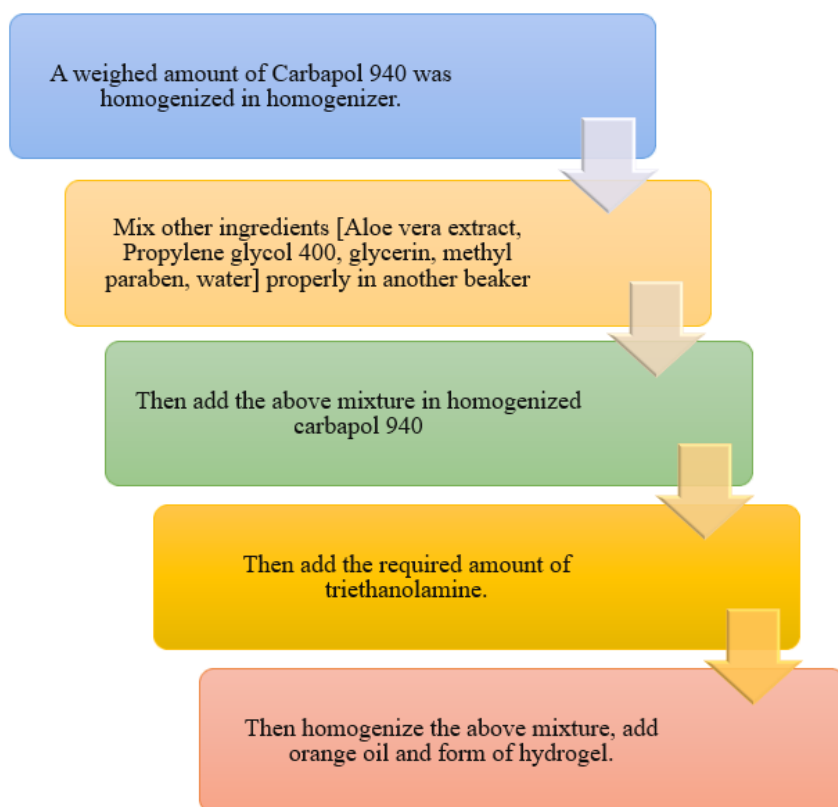
Materials:

Aloe vera was collected from the Botanical Garden of Ashokrao Mane College of Pharmacy Peth Vadgaon Maharashtra in the month of March 2025.

Preparation of extract:

The fresh aloe vera pulp is extracted from the aloe vera then aloe vera pulp is converted into a liquid by a mixer. [10,11]

Method of preparation: [12]



Characterizations of Hydrogel

1. Physical evaluation:

Visual inspection was performed on physical characteristics such colour, look, and consistency. [13]

2. pH:

A digital pH meter was used to measure the pH of each formulation after around 1 g of gel was combined with 100 ml of water. [14]

3. Spreadability:

Spread-ability Standard-sized glass slides were taken in two sets. A 60mm- long piece of herbal formulation gel was sandwiched between the two slides. Removed the extra gel that had attached to the glass slide surface and securely mounted it on a stand. A 20 g weight was fastened to the top slide, and the weight had an impact on how long it took for the slide to travel 60 mm. The experiment was repeated three times to determine the meantime, and the following formula was used to determine the Spreadability. [15,16]

$$\text{Spreadability} = \frac{\text{Weight} \times \text{Length}}{\text{Time}}$$

4. Percentage Moisture Content:

The formulations percentage moisture loss was calculated. Accurate two-gram formulations (F1 to F9) were weighed and stored in a desiccator with 50 gms of anhydrous calcium chloride. The formulas were weighed after three days. The following calculation was used to determine the % moisture loss: [17,18]

$$\text{Percentage moisture loss} = \frac{\text{Initial Weight} - \text{Final weight}}{\text{Final Weight}} \times 100$$

5. Viscosity:

The viscosity of the formulation was measured at 25 degrees Celsius using a Brookfield viscometer. The measurement was taken at 25 rpm speed by the L63 spindle. [19,20]

6. Washability:

The product was applied on hand and was observed under running water.[21].

Preparation of Hydrogel

Table No. 1. Formulation Table of Aloe Vera Hydrogel

Sr. no.	Ingredient	F1	F2	F3	F4	F5	F6	F7	F8	F9
1	Extract of aloe vera (ml)	15	15	15	15	15	15	15	15	15
2	Carbopol 940(mg)	175	175	175	185	185	185	200	200	200
3	Propylene Glycol (ml)	3	5	7	3	5	7	3	5	7
4	Glycerin (ml)	1	1	1	1	1	1	1	1	1
5	Methylparaben (mg)	300	300	300	300	300	300	300	300	300
6	Triethanolamine (ml)	1	1	1	1	1	1	1	1	1
7	Distilled water (ml)	Q.S.	Q. S	Q. S	Q. S	Q. S	Q. S	Q. S	Q. S	Q. S
8	Orange oil (ml)	Q. S.	Q. S	Q. S	Q. S	Q. S	Q. S	Q. S	Q. S	Q. S

RESULTS AND DISCUSSION

RESULTS:

1.Physical evaluation:



The created hydrogel formulation is semisolid in consistency and has a light white colour, which appearance is good by physical inspection

2	Appearance	Good
3	Consistency	Semi-solid

Table No. 2. Physical Evaluation of Aloe Vera Hydrogel

Sr.no	Physical evaluation	Inference
1	Color	Light White

Table No. 3. PH of Aloe Vera Hydrogel

Formulation	F1	F2	F3	F4	F5	F6	F7	F8	F9
pH	4.58	4.77	5.12	5.18	5.32	5.89	5.96	6.12	6.14

2. pH

The prepared Hydrogel formulation has pH of F6 is = 5.89

3. Spreadability:

The prepared hydrogel formulation has good Spreadability at F6= 1.97.

Table No. 4. Spreadability of Aloe Vera Hydrogel

Formulation	F1	F2	F3	F4	F5	F6	F7	F8	F9
Spreadability	1.76	1.79	1.82	1.86	1.92	1.97	1.70	1.72	1.78

4. Percentage Moisture Content:

The prepared hydrogel formulation of % Moisture Content at F6= 95.90 %

Table No. 5. Percentage Moisture Content of Aloe Vera Hydrogel

Formulation	F1	F2	F3	F4	F5	F6	F7	F8	F9
% Moisture Content	93.23	93.74	93.98	94.52	94.86	95.90	92.10	92.34	92.96

5. Viscosity

The prepared hydrogel formulation viscosity is F6=4469 cp

Table No. 8: Viscosity of Aloe Vera Hydrogel

Formulation	F1	F2	F3	F4	F5	F6	F7	F8	F9
Viscosity	3642	3884	3990	4150	4185	4469	4552	4648	4723

DISCUSSION

A hydrogel is a solid material that feels like jelly and may have hard, weak, or soft properties. Gels are defined as a highly diluted cross-linked system that, in its equilibrium state, exhibits no flow. Gels are primarily liquids by weight but, due to a three-dimensional cross-linked network within the liquid, they behave like solids. The tacky stick (tack) and structure of a gel are due to crosslinking

within the liquid. Gels can be viewed as a dispersion of liquid molecules in solids, where liquid is the discrete continuous phase and solid is the continuous phase. A network composed of hydrophilic polymer chains is referred to as a hydrogel. It can sometimes occur as a colloidal gel with water as the dispersion medium. Hydrogels are synthetic or natural polymeric networks with very high absorbing capacity—they can absorb over 90% water. Due to their high water content,



hydrogels also exhibit a certain level of elasticity which is very close to the real tissue. "Hydrogel" was first used as a term in a book in 1894. Plant-based formulations and drugs have attracted large attention from the public because of their creative applications. The objective of the present project is to develop and analyze an aloe vera extract hydrogel formula. Herbal cosmetics can be used by all skin types. Indian herbs are significant and popular worldwide. Beauty products are also herbal cosmetics. That pass desirable physiological activities like healing, smoothing appearance, and enhancing and conditioning properties due to herbal ingredients. Compared to synthetic cosmetic products Herbal products are low in toxicity, mild, and biodegradable. The common belief that chemical-based cosmetics are harmful to the skin and airways increased consumer consciousness of herbal products and stimulated demand for natural materials and natural extracts in cosmetic formulation.

CONCLUSION:

Herb-based products are believed to be safe for long periods of time. In contrast to creams and ointments, local application of hydrogels at the sites of pathology provides several advantages in the form of faster release of a drug directly to the site of action. Drugs have been recently used topically with the help of hydrogels, which is a prevalent mode of delivery. The bioavailability of the drug can be enhanced by the better absorption abilities of the hydrogel formulation. Between Nine different batches of formulation F6 is best because their physical assessment, pH, Spreadability, % moisture content, viscosity, washability and antibacterial activity all of these values are very close to the standard value. Anti-inflammatory and anti-microbial action of the plant has been reported in the literature. Herbal preparations are gaining more and more popularity on the international market nowadays.

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