

FORMULATION AND CHARACTERIZATION OF ALOE VERA COSMETIC HERBAL HYDROGEL

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ABSTRACT

Present study deals with the development and characterization of aloe vera cosmetic herbal hydrogel preparation using inner part of aloe vera leaf, acacia, hydroxy propyl methyl cellulose (HPMC), carbopol 934, glycerine, tartaric acid, potassium sorbate and sodium benzoate. Aloe vera liquid was prepared by heating at low temperature and the hydrogel was prepared by simple dissolving method of other ingredients in a specific manner. Four formulations were developed which differ in the ratio of hydrogel forming polymers. Formulation A1, A2, A3 and A4 were composed of acacia, HPMC, carbopol 934 in the ratio of 1:1:1, 1:2:1, 2:1:1 and 1:1:2 respectively. All the formulations were evaluated for percentage moisture content, transparency, smoothness, weight on drying, viscosity, pH and microbial growth. On the basis of evaluation parameter formulation A4 was selected as developed formulation. On the basis of evaluation study, it can be concluded that aloe vera cosmetic herbal hydrogel may be used for cosmetic purpose.

Keywords: Aloe vera, Hydrogel, Herbal formulation, Cosmetic.

INTRODUCTION

Aloe vera is an important medicinal plant. It has larger demands and is traded in medicinal drug markets of the world for flavouring liquid and a source of 'aloin' (4.5 to 25 per cent)¹. In more traditional uses, physicians use aloe vera-based creams to heal serious thermal injuries, such as burns and frostbite. Dentists employ aloe vera gels to reduce swelling and inflammation of the gums. Dermatologists rely on aloe vera products to help clear acne, and optometrists find the products helpful in soothing eye inflammations. Professional sports trainers treat their athlete's muscle aches and sprains, skin abrasions, and blisters with aloe vera. Cosmetics companies, for its beneficial effect of aloe Vera, incorporate it into, cosmetic and skin care products. It is also for the marketing appeal the words "made with aloe" attract the consumer. Drinking aloe vera with honey is said to have the therapeutic effects on arthritis, ulcers, diabetes, and other health conditions. The wide range of applications, and the beneficial effects of its use, continues to increase the popularity of this ancient plant^{2,3}.

Aloe vera is a perennial, drought-resisting, succulent plant belonging to the Lily (Liliaceae) family which, historically, has been used for a variety of medicinal purposes. The plant has stiff grey-green lance-shaped leaves containing clear gel in a central mucilaginous pulp. Clinical evaluations have revealed that the pharmacological active ingredients are concentrated in both the gel and rind of the aloe vera leaves. These active ingredients have been shown to have analgesic and anti-inflammatory effects^{4,5}.

The true aloe vera plant is called *Aloe barbadensis Miller*, otherwise called the Curacao aloe, and is the most medicinally potent of the 300 (and more) varieties found around the world. Most people in the UK today know of aloe vera because of its inclusion in many popular cosmetic products. Over the years, the plant has been known by a number of names such as 'the wand of heaven', 'heaven's blessing' and 'the silent healer'^{3,4}.

Number of aloe vera herbal formulations available in the form of cream, gel, facial solution, moisturizer etc, while these formulations contain very less quantity of aloe vera extract and herbal component. These formulations may also contain toxic ingredients such as surfactant. Present investigation deals with the development of aloe vera cosmetic herbal hydrogel formulation i.e. cosmetic facial containing higher quantity of aloe vera leaf extract and herbal components.

MATERIAL AND METHOD

Aloe vera pulp was obtained from cultivated aloe vera. All other ingredients like acacia, HPMC, carbopol 934, glycerine, albumin, ascorbic acid, potassium sorbate, sodium benzoate, etc were

purchased from local market of CDH, India and Himedia, India. Double distilled water was used throughout the study.

Preparation of aloe vera herbal gel

An aloe vera gel is converted into liquid form by heating at a low temperature for two hours. It is necessary that it should be heated at a low temperature in order to retain thermo sensitive ingredients present in it. Tartaric acid is added to the aloe vera concentrate to adjust the pH within the range from 5.5 to 6.0. In separate container, the hydrogel forming polymers were dissolved in small amount of double distilled water in various proportions as shown in Table no.1, and then remaining ingredients i.e. glycerin, potassium sorbate and sodium benzoate were added. Now, aloe vera liquid extract was added to it and make up the volume up to 100 ml. The pH of this gel preparation was maintained 6±0.4 and stored in a well closed container.^{6,7}

Evaluation of aloe vera herbal gel

The aloe vera herbal gel was evaluated as follows

(i) Percentage Moisture Content

Percentage moisture loss from the formulations were determined by the method reported by Devi⁸ et al. Two gram formulations were weighed (A1, A2, A3 & A4) accurately and kept in a desiccators containing 50gm anhydrous calcium chloride. After three days, the formulations were weighed. The percentage moisture loss was calculated using the formula as follows:

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

(ii) Transparency, smoothness and weight on drying

The 5ml gel formulation taken in the 10ml (Borosil[®]) test tube and visually checked for its transparency. The smoothness of the gel formulation was tested by rubbing between the fingers and observes whether the gel is smooth, clumped, homogenous or rough. The relative density of the formulation or weight/ml of the formulation was determined by taking the weight in gm of 10ml formulation & 10ml distilled water using RD bottle.

(iii) Viscosity pH and microbial growth

Viscosity is an important feature to determine the resistance of flow of gel formulation so that it can spread on the skin properly. It was determined with the help of viscometer (Brookfield) using 2 number spindles. pH of the formulation was determined by using pH meter (Elico). In this method, electrode was washed with double distilled

water, dried with the help of tissue paper and then dipped in 20ml gel formulation. The average pH (n=3) of the gel formulations were recorded at ambient condition.

Nutrient agar media was used in microbial growth study. In this method the blank and sample (n=3) petriplates were used and the gel samples were aseptically transferred on to the sample plates in a cross pattern. The microbial growth was observed daily for 14 days⁶.

RESULTS AND DISCUSSION

Aloe vera herbal gel prepared from aloe vera leaf extract (liquid) from inner part of leaf, natural ingredients and small amount of synthetic ingredients. Aloe vera liquid extract was prepared by heating inner part of aloe vera leaf at low temperature in order to retain thermolabile ingredients present in it. The pH of the herbal gel formulation maintained at 6±0.4 so as to make skin compliant formulation. Four herbal gel formulations were prepared varying polymer ratios as shown in Table 1. All the formulations were evaluated for percentage moisture loss, transparency, smoothness, weight on drying, viscosity, pH and microbial growth. Evaluation results are shown in Table no.2. Viscosity is one of the most important parameter as it reflects the semisolid nature of the formulation and spreadability upon the skin surface. Viscosity of the herbal gel formulations determined with the help of Brookfield

viscometer using spindle number 2. The value of viscosity found from 1098 to 1184 cp (centipoise). Formulation A4 consist of maximum viscosity i.e. 1184 cp, which was considered as optimized formulation. Because, higher the viscosity gives more thickness and consistency to the gel and require less concentration of the polymers to get optimum viscosity. The higher viscosity of formulation A4 attributed due to higher proportion of carbopol 934.

All the formulation found to be translucent and smooth in nature which may be due to the composition of the ingredients. Weight before and after drying and density of the formulation was evaluated so as to maintain batch to batch uniformity. Percent moisture loss of the formulation was found to be 95.73 to 95.86. Formulation A4 had highest moisture content i.e. 95.86%. pH of all the formulations were adjusted 6±0.4. Next day pH was again observed which was found to be between 6.2 to 6.4. All the formulations contained 1% w/v preservatives i.e. potassium sorbate and sodium benzoate. Studies were performed for microbial growth using nutrient agar and none of the petriplates showed microbial colony even two weeks incubation.

Aloe vera herbal gel can be prepared easily with higher quantity of herbal component without using toxic ingredient. It may be produced commercially for cleaning, softening and improving texture of the skin.

Table 1: Composition of aloe vera herbal hydrogel formulations A1 to A4

Ingradiends	A1	A2	A3	A4
Aloe vera ml	75	75	75	75
Acacia gm	0.5	0.375	0.75	0.375
HPMC gm	0.5	0.75	0.375	0.375
Carbopol 934 gm	0.5	0.375	0.375	0.75
Glycerine ml	5	5	5	5
Albumin				
Ascorbic acid				
Tartaric acid gm	1.5	1.5	1.5	1.5
Potassium sorbate gm	0.5	0.5	0.5	0.5
Sodium benzoate gm	0.5	0.5	0.5	0.5
Double distilled water q.s. up to ml	100	100	100	100

Table 2: Evaluation data of aloe vera herbal hydrogel formulation A1 to A2

Evaluation Parameters	A1	A2	A3	A4
Rheology				
Viscosity in cpu	1168	1149	1098	1184
Transperancy	Translucent	Translucent	Translucent	Translucent
Smoothness/ Roughness	Smooth	Smooth	Smooth	Smooth
Density	10.48	10.46	10.52	10.47
% Moisture Loss	95.73	95.82	95.81	95.86
pH	6.3	6.4	6.3	6.2
Microbial Growth	No Growth	No Growth	No Growth	No Growth

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