IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A Review On Formulation And Evaluation Of Alovera Gel

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ABSTRACT

Aloe Vera, commonly known as Barbados or Curacao Aloe, is an herbal medicine with along tradition of use by a variety of cultures. The succulent plant grows in arid and subtropical climates and is best known for 2 distinct preparations: the clear mucilaginous gel that is widely used for the treatment of minor burns, especially sunburns, and the thick sap of the leaves that turns yellow-brown and has strong laxative effects that caution its use.

The traditional uses of the clear mucilaginous gel are manifold, ranging from topical applications to reduce perspiration to oral dosing for diabetes and a range of gastrointestinal ailments. The efficacy of aloe Veragel to treat burn wounds, genital herpes, and seborrhea dermatitis have been shown in clinical trials, but other indications such as psoriasis or internal application for the treatment of type 2 diabetes remain inconclusive.

The main limitation of the current clinical knowledge about aloeveragelis small clinical studies that often lack rigorous methodology. Several clinical trials are being conducted to further evaluate the use of aloeveragel for a
variety of disorders, as well as to further confirm traditional uses of the plant extract.

Keywords: AloeVera, Barbados, Dermatology.

I. INTRODUCTION

Aloevera (syn. *Aloe barbadensis* Mill., Fam. Liliaceae), also known as Barbados or Curaçao Aloe, has been used in traditional and folk medicines for thousands of years to treat and cure a variety of diseases. Although the plant is native to northern parts of Africa, it has rapidly spread across the world because its cultivation is easy. An important distinction has to be made between the strongly laxative and purgative latex derived from the bundle-sheath cells and the clear mucilaginous gel. The plant has been used by Egyptians, Assyrians, and Mediterranean civilizations, as well as in Biblical times. A variety of aloe species are still used in folk medicines of Africa and Asia. Hunters in the Congo reportedly rub their bodies in the clear mucilaginous gel to reduce perspiration; some African tribes apply the gel for chronic conjunctivitis; the gel is used in India for the treatment of asthma.

Aloeveragelis used as an ethnomedicine in Trinidad and Tobago for hypertension. The most common folk use of aloe has been for the treatment of burn wounds and specifically to aid in the healing process, reduce inflammation, and tissue scaring. The gel was described by Dioscorides and used to treat wounds and mouth infections, soothe itching, and cure sores. The use of aloevera gel as a household remedy in the United States was triggered by reports of its beneficial effect on radiation dermatitis followed by a boom in cultivation in the 1930s; it remains a common plant and for burns and abrasions. Important contemporary uses of the gel exist in traditional medicines of India, China, and Mexico, as well as Middle America and the West Indies. Mexico is producing roughly 47% of aloe worldwide with a total sales volume of $123.5 million US dollars as of 2008.

Despite its widespread popularity, scientific evidence on the aloe vera gel remains sparse. Aloe vera gel is regarded as safe if applied topical with only a few allergic reactions being reported. The efficacy of aloeveragel to treat burn wounds, genital herpes, and seborrheic dermatitis have been shown in clinical trials, but other indications such as psoriasis or internal application for the treatment of type 2 diabetes remain inconclusive. The major application of aloeveragel remains as a skin moisturizer in cosmetics and as an aprèstreatment for sunburns, for which it has proven its effectiveness.

The Aloe vera plant has been known and used for centuries for its health, beauty, medicinal and skin care properties. The name Aloe vera derives from the Arabic word “Alloeh” meaning “shining bitter substance,” while “vera” in Latin means “true.” 2000 years ago, the Greek scientists regarded Aloe vera as the universal panacea. The Egyptians called Aloe “the plant of immortality.” Today, the Aloe vera plant has been used for various purposes in dermatology.

Fig: Aloevera plant leaves

HISTORY

Aloevera has been used for medicinal purposes in several cultures for millennia: Greece, Egypt, India, Mexico, Japan and China. Egyptian queens Nefertiti and Cleopatra used it as part of their regular beauty regimes. Alexander the Great, and Christopher Columbus used it to treat soldiers' wounds. The first reference to Aloe vera in English was a translation by John Goodyew in A. D. 1655 of Dioscorides' Medical treatise De Materia Medica. By the early 1800s, Aloe vera was in use as a laxative in the United States, but in the mid- 1930s, a turning point occurred when it was successfully used to treat chronic and severe radiation dermatitis.

Aloevera is a succulent plant with thick, fleshy, serrated, lanceolate- shaped leaves of green-greyish color. Aloe vera inner gel is obtained from the lower leaves of the plant by slicing the leaf open. The gel is clear, odorless, and tasteless and should be free of leaf skin or yellow parts. No consistent standardization has been established, but the International Aloe Science Council (IASC), a trade association of internationally based aloe producers and marketers, requires adherence to certain specifications for the product to be certified.[10] Other preparations include a hydrophilic cream containing 0.5% aloeverageland an emulsion consisting of 30% aloe vera gel.

The botanical name of Aloevera is Aloe barbadensis miller. It belongs to Asphodelaceae (Liliaceae) family, and is a shrubby or arborescent, perennial, xerophytic, succulent, pea- green color plant. It grows mainly in the dry regions of Africa, Asia, Europe and America. In India, it is found in Rajasthan, Andhra Pradesh, Gujarat, Maharashtra and Tamil Nadu.

The plant has triangular, fleshy leaves with serrated edges, yellow tubular flowers and fruits that contain numerous seeds. Each leaf is composed of three layers:

1. An inner clear gel that contains 99% water and rest is made of glucomannans, amino acids, lipids, sterols and vitamins.

2. The middle layer of latex which is the bitter yellow sap and contains anthraquinones and glycosides.

3. The outer thick layer of 15–20 cells called as rind which has protective function and synthesizes carbohydrates and proteins. Inside the rind are vascular bundles responsible for transportation of substances such as water (xylem) and starch (phloem).

ACTIVE COMPONENTS WITH ITS PROPERTIES

Aloevera contains 75 potentially active constituents:

Vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids andamino acids.

1. Vitamins: It contains vitamins A (beta-carotene), C and E, which are antioxidants. It also contains vitamin B12, folic acid, and choline. Antioxidant neutralizes free radicals.

2. Enzymes:

- It contains 8 enzymes:
- Aliiase
- Alkaline phosphatase
- Amylase
- Bradykinase
- Catalase
- Cellulose
- Lipase.

Bradykinase helps to reduce excessive inflammation when applied to the skin topically, while others help in the breakdown of sugars and fats.

3. Minerals: It provides calcium, chromium, copper, selenium, magnesium, manganese, potassium, sodium and zinc. They are essential for the proper functioning of various enzyme systems in different metabolic pathways and few are antioxidants.

4. Sugars: It provides monosaccharides (glucose and fructose) and polysaccharides: (glucomannans /polymannose). These are derived from the mucilage layer of the plant and are known as mucopolysaccharides.

The most prominent monosaccharide is mannose-6-phosphate, and the most common polysaccharides are called glucomannans. Acemannan, a prominent glucomannan has also been found. Recently,a glycoprotein with antiallergic properties, called alprogen and novel anti-inflammatory compound, C-glucosyl chromone, has been isolated from Aloeveragel.

5. Anthraquinones: It provides 12 anthraquinones, which are phenolic compounds traditionally known as laxatives. Aloin and emodin act as analgesics, antibacterials and antivirals.

6. Fatty acids: It provides 4 plant steroids; cholesterol, campesterol, β- sisosterol and lupeol. All these have anti-inflammatory action and lupeol also possesses antiseptic and analgesic properties.

7. Hormones: Auxins and gibberellins that help in wound healing and have anti-inflammatory action.

8. Others: It provides 20 of the 22 human required amino acids and 7 of the 8 essential amino acids. It also contains salicylic acid that possesses anti- inflammatory and antibacterial properties. Lignin, an inert substance, when included in topical preparations, enhances penetrative effect of the other ingredients into the skin. Saponins that are the soapy substances form about 3% of the gel and have cleansing and antiseptic properties.

II. MATERIAL AND METHOD

Material:

In Aloevera powder, the carbohydrate content was determined according to mannose and phenolic compounds in terms of gallic acid.

. Aloevera pulp

. Liquid glucose

. Glycerin

Weight uniformity, content uniformity, the organoleptic properties evaluation, releasing the active ingredient in the phosphate buffer (pH, 6.8) and taste evaluation were examined by Latin square method.

Method:

. A few Aloevera leaves from an Aloevera (Barbadensis Miller) plant were collected and washed with water thoroughly.

. A sharp knife was taken and carefully peeled off the yellow layer just beneath the green rind avoiding the vascular bundles and the top rind was removed.

. The bottom rind was similarly removed to discard the significant amount of mucilage which gets attached onto this.

. The clear mucilaginous gel was scooped out with a spoon. 50 ml crude clear Aloe vera extract was mixed uniformly by using magnetic stirrer and the plant extract was filtered through a whatman filter paper.

. Finally, it was transferred into a sterilized, clean glass jar and stored in the refrigerator

FORMULATION OF ALOE VERA GEL

. The gel base was prepared by dispersing 1% carbomer 940 in distilled water at 80°C with constant stirring at a moderate speed using magnetic stirrer and pH was adjusted to 6 - 7 using triethanolamine.

. 50 ml of Aloevera extract was added into it and gel base using Aloevera extract was prepared.

. The oil phase of the emulsion was prepared by dissolving 0.5 ml span 20 in 7.5 ml coconut oil.

. 1% of zinc oxide was added into it. Zinc oxide protects skin from UV induced damage.

. The aqueous phase was prepared by dissolving 1 ml tween 20 in purified water.

. Required amount of methyl paraben was added into aqueous phase and propyl paraben was dissolved in oil phase.

. Two phases were separately heated to 70 - 80 °C.

. The oil phase was added drop wise to aqueous phase and was mixed together with continuous stirring using mechanical stirrer at specified speed until it cooled down to room temperature. The prepared emulsion was mixed with the gel in 1:1 ratio with gentle stirring to obtain the Aloeveragel.

III. MECHANISM OF ACTIONS

1. ***Healing properties*****:** Glucomannan, a mannose-rich polysaccharide, and gibberellin, a growth hormone, interacts with growth factor receptors on the fibroblast, thereby stimulating its activity and proliferation, which in turn significantly increases collagen synthesis after topical and oral Aloe vera. Aloe gel not only increased collagen content of the wound but also changed collagen composition (more type III) and increased the degree of collagen cross linking. Due to this, it accelerated wound contraction and increased the breaking strength of resulting scar tissue. An increased synthesis of hyaluronic acid and dermatan sulfate in the granulationtissue of a healing wound following oral or topical treatment has been reported.

2. ***Effects on skin exposure to UV and gamma radiation:*** Aloeveragel has been reported to have a protective effect against radiation damage to the skin. Exact role is not known, but following the administration of aloe vera gel, an antioxidant protein, metallothionein, is generated in the skin, which scavenges hydroxyl radicals and prevents suppression of superoxide dismutase and glutathione peroxidase in the skin. It reduces the production and release of skin keratinocyte-derived immunosuppressive cytokines such as interleukin- 10 (IL- 10) and hence prevents UV-induced suppression of delayed type hypersensitivity.

3. ***Anti-inflammatory action:*** Aloe vera inhibits the cyclooxygenase pathway and reduces prostaglandin E2 production from arachidonic acid. Recently, the novel anti-inflammatory compound called C-glucosyl chromone was isolated from gel extracts.

4. ***Effects on the immune system:*** Alprogen inhibit calcium influx into mast cells, thereby inhibiting the antigen-antibody-mediated release of histamine and leukotriene from mast cells. In a study on mice that had previously been implanted with murine sarcoma cells, acemannan stimulates the synthesis and release of interleukin- 1 (IL- 1) and tumor necrosis factor from macrophages in mice, which in turn initiated an immune attack that resulted in necrosis and regression of the cancerous cells. Several low-molecular-weight compounds are also capable of inhibiting the release of reactive oxygen free radicals from activated human neutrophils.

5. ***Laxative effects:*** Anthraquinones present in latex area potent laxative. It increases intestinal water content, stimulates mucus secretion and increases intestinal peristalsis.

6. ***Antiviral and antitumor activity:*** These actions may be due to indirect or direct effects. Indirect effect is due to stimulation of the immune system and direct effect is due to anthraquinones. The anthraquinone aloin inactivates various enveloped viruses such as herpes simplex, varicella zoster and influenza. In recent studies, a polysaccharide fraction has shown to inhibit the binding of benzopyrene to primary rat hepatocytes, thereby preventing the

formation of potentially cancer-initiating benzopyrene-DNA adducts. An induction of glutathione S-transferase and an inhibition of the tumor-promoting effects of phorbol myristic acetate has also been reported which suggest a possible benefit of using aloe gel in cancer chemoprevention.

7. *Moisturizing and anti-aging effect:* Mucopolysaccharides help in binding moisture into the skin. Aloe stimulates fibroblast which produces the collagen and elastin fibers making the skin more elastic and less wrinkled. It also has cohesive effects on the superficial flaking epidermal cells by sticking them together, which softens the skin. The amino acids also soften hardened skin cells and zinc acts as an astringent to tighten pores. Its moisturizing effects has also been studied in treatment of dry skin associated with occupational exposure where aloeveragel gloves improved the skin integrity, decreases appearance of fine wrinkle and decreases erythema. It also has anti-acne effect.

8. *Antiseptic effect:* Aloe vera contains 6 antiseptic agents: Lupeol, salicylic acid, urea nitrogen, cinnamonic acid, phenols and sulfur. They all have inhibitory action on fungi, bacteria and viruses.

ALOE VERA USES

External

- Mild to moderate burns as well as erythema
- Genital herpes
- Seborrheic dermatitis

Internal:

. Adjunct therapy of spontaneous fibrosarcomas in dogs and cats.

Other Potential Uses:

(Determined by clinical trials and/or official monographs and/or empirical use)

- Psoriasis vulgaris
- Skin moisturizer
- Type 2 diabetes
- Malignancies and immunodeficiency viruses in cats
- Oral lichen planus infections
- Angina pectoris
- Ulcerative colitis
- UV-induced erythema14 Kidney stones
- Alveolar osteitis

Clinical uses:

The clinical use of aloevera is supported mostly by anecdotal data. Though most of these uses are interesting, controlled trials are essential todetermine its effectiveness in all the following diseases

Uses based on scientific evidence Uses based on tradition or theory

SIDE EFFECTS

- Topical: It may cause redness, burning, stinging sensation and rarely generalized dermatitis in sensitive individuals. Allergic reactions are mostly due to anthraquinones, such as aloin and barbaloin. It is best to apply it to a small area first to test for possible allergic reaction.

- Oral: Abdominal cramps, diarrhea, red urine, hepatitis, dependency or worsening of constipation. Prolonged use has been reported to increase the risk of colorectal cancer. Laxative effect may cause electrolyte imbalances (low potassium levels) .

- Contraindication: Contraindicated in cases of known allergy to plants in the Liliaceae family.

- Pregnancy and breastfeeding: Oral aloe is not recommended during pregnancy due to theoretical stimulation of uterine contractions, and in breastfeeding mothers, it may sometime causes gastrointestinal distress in the nursing infant.

- Interactions: Application of aloe to skin may increase the absorption of steroid creams such as hydrocortisone. It reduces the effectiveness and may increases the adverse effects of digoxin and digitoxin, due to its potassium lowering effect. Combined use of Aloe vera and furosemide may increase the risk of potassium depletion. It decreases the blood sugar levels and thus may interact with oral hypoglycemic drugs and insulin.

- Thus, though Aloe vera has wide spectrum of the properties and uses, some of them could be myths and some of them could be real magic. In future, controlled studies are required to prove the effectiveness of Aloevera under various conditions.

CLINICAL REVIEW

Clinical data on aloeveragel is sparse, which might be in part due to the many possible indications for the gel. The table outlines 18 clinical trials on a total of 7,297 subjects conducted for various types of aloe gel-derived preparations on numerous indications. The design of the clinical studies evaluated ranges from placebo- controlled, double-blind, multicenter studies to equivalence investigations. One of the most important factors is the composition of the aloevera preparation used, which in most cases is a certain purity aloeveragel without further elucidation of compound quantity. This discrepancy complicates a direct comparison of the studies.

Three randomized studies on the efficacy of aloe vera gel for radiation-induced dermatitis reported either a delayed onset of skin changes if aloeveragel was applied in addition to mild soap against mild soap alone or no efficacy of the gel against a placebo gel or aqueous cream. A review of aloe vera for radiation- induced skin damage concluded that there is no evidence for a protective effect of the gel and that more research with well- designed studies is needed to evaluate potential benefits. Similar results were obtained from a clinical study evaluating the use of aloe vera gel for the treatment of radiation-induced oral mucositis with no significant differences from the placebo group.

The historical application of aloevera gel for the treatment of wounds has been evaluated in surgical wounds and the randomized study concluded that there was a significant delay in complete wound healing for the aloe vera gel compared to standard treatment.

The use of aloe vera gel for the treatment of lichen planus lesions was examined in 2 clinical trials with small sample sizes. One study examined the use of aloe vera gel (containing 70% mucilage) in oral lichen planus lesions compared to placebo over 8 weeks and found a significant improvement in 88% of patients versus 4% in the placebo group. Another study used a similar design but with unspecified composition of the aloeveragel and reported significant improvement in 82% of patients versus 5% in the placebo group over a period of 8 weeks.

Three clinical trials on the effect of aloevera gel for the treatment of psoriasis vulgaris were inconclusive. One study reported a significant beneficial effect of aloe vera extract 0.5% in hydrophilic cream compared to hydrophilic cream alone in reducing psoriatic plaques and inflammation, while the other study did not find a significant benefit of 98% pure aloevera gel versus placebo after 12 weeks. A third study compared aloevera cream containing 70% mucilage to 0.1% triamcinolone acetonide cream over the course of 8 weeks and found it to be equally effective.

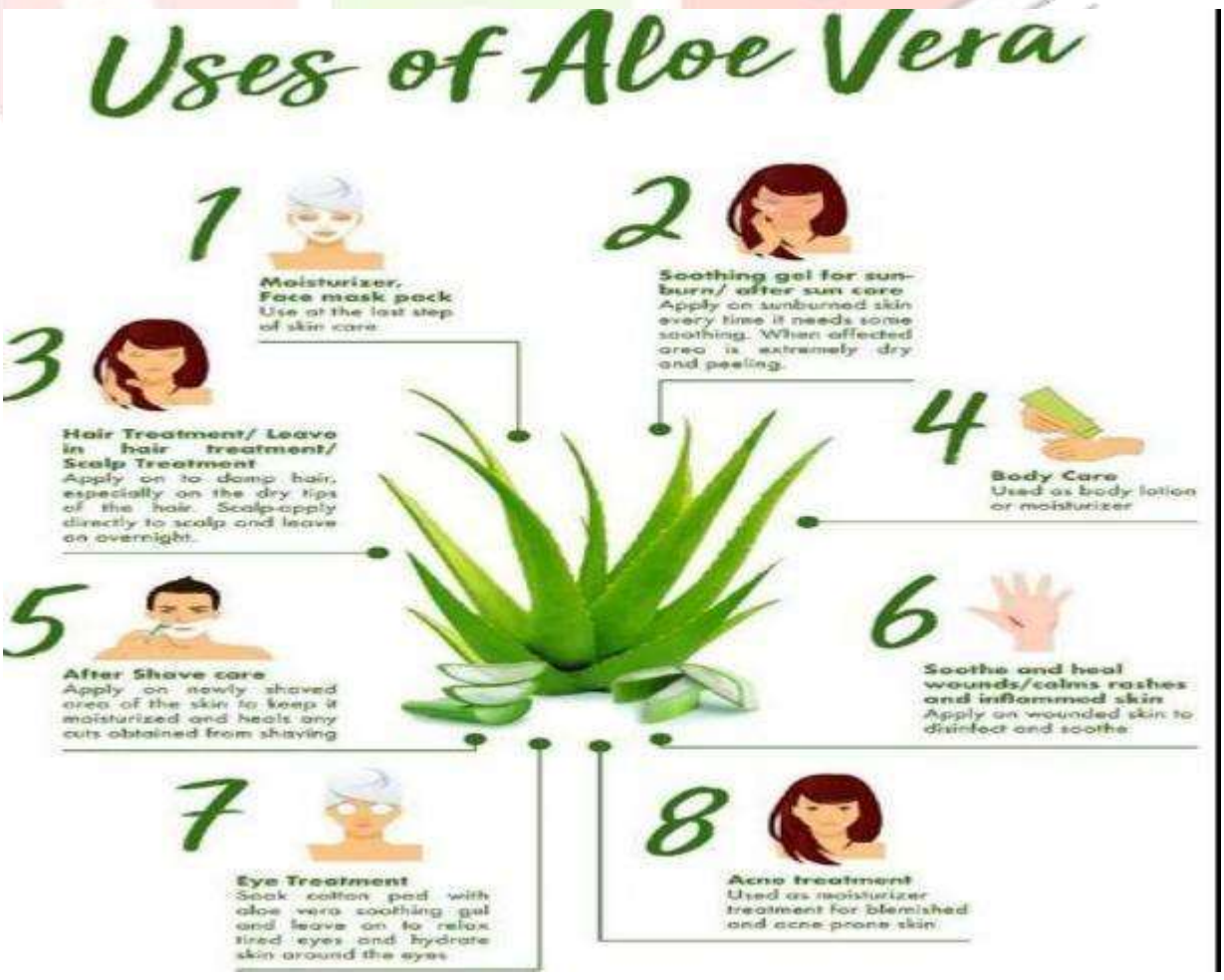
The widespread use of aloe vera gel as moisturizer and for the treatment of xerosis was evaluated in two studies. The moisturizing effects of aloevera resulted in increased water content in the stratum corneum after short-term and long-term application of a hydrophilic cream

containing various concentrations of freeze-dried aloe vera concentrate compared to the base cream alone. A partially blinded, non-placebo study suggests a benefit of freeze-dried aloe vera gel on the inner side of a glove to dry skin, although this study lacks both control and complete blinding.

In addition, aloe vera gel lotions are popular for the treatment of sunburn (UV- induced erythema). One randomized, double-blind, placebo-controlled trial compared the anti-inflammatory effect of 97.5% pure aloe vera gel to 1% hydrocortisone and aplacebo gel. Aloeveragel, if applied under anocclusive bandage for 2 days following UV exposure, significantly reduced inflammation compared to placebo gel or 1% hydrocortisone in placebo gel, but was less effective than 1% hydrocortisone cream. The authors suggest that aloevera gel might be useful for the treatment of inflammatory skin conditions. Two studies evaluated beneficial effects of aloe vera gel on irritable bowel syndrome and ulcerative colitis, which resulted in no significant effect for either indication, although a patient-evaluated improvement was seen for the treatment of ulcerative colitis after 1 month.

Based on its immune omodulatory effect, acemannan was evaluated for the adjunct treatment of HIV infections in addition to standard treatment (either zidovudine or didanosine). The one-year, double-blind, placebo- controlled, randomized trial concluded that there were no differences in CD4 count or survival after weeks between acemannan capsules and placebo. Since acemannan has been shown to stimulate macrophage activation and enhances wound healing, 1 study evaluated the use of acemannan hydrogel in a patch for the treatment of alveolar osteitis after oral surgery. Acemannan significantly reduced the incidence and severity of

the inflammatory process compared to clindamycin Gelfoam patches. Although the study lacks a complete clinical design, the comparison between the treatment groups showed an impressive advantage of acemannan in the prevention of alveolar osteitis ina large patient collective (n = 1, 1 9 4) .



IV. RESULTS AND DISCUSSION

The aloeveragel was evaluated as follows:

1. Percentage Moisture Content:

Percentage moisture loss from the formulations were determined by the method reported by Deviet al. Two gram formulations were weighed (A 1, A 2, A3 and A4) accurately and kept in a desiccators containing 50 gm anhydrous calcium chloride. After three days, the formulations were weighed. The percentage moisture loss was calculated using the formula as follows: Percentage moisture loss = initial weight - final weight/final weight x100 the Percentage moisture loss = 1 gm.

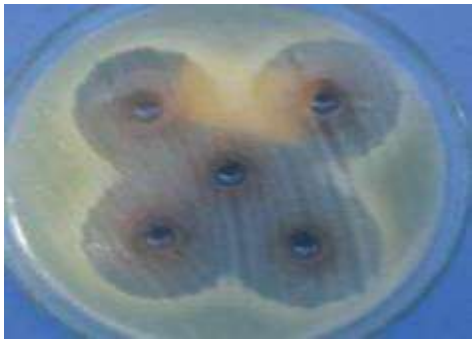
2. Transparency, smoothness and weight on drying:

The 5 ml gel formulation taken in the 10ml 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 weightingm. of 10 ml formulation and 10 ml distilled water using RD bottle.

3. 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.



V. CONCLUSION

The present study is aimed to test the quality of Aloe Vera gel in multiple aspects. By using Aloe Vera gel, showed a multipurpose effect and all these ingredients showed significant different activities. Based on results and discussion, the formulations F1H, F2H and F3H were stable at room temperature and can be safely used on the skin.

Aloe Vera gel are used to stimulate blood circulation, rejuvenates the muscles and help to maintain the elasticity of the skin and remove dirt from skin pores. The advantage of gel is their nontoxic nature, reduce the allergic reactions and time tested usefulness of many ingredients.

The formulation was found homogenous, easily washable and also had very slightly alkaline pH which were compatible with normal skin physiology. Angle of repose is a characteristic related to inter particulate friction or resistance to the movement between the particles. The flow property has been classified as per limit of Indian Pharmacopoeia in terms of the angle of repose. The results of all these parameters indicated that the gel of combined form possess good flow properties and good packing ability. Consequently, it exhibited good flow properties for formulation to achieve soft, fresh and clean formulation.

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