FORMULATION AND EVALUATION OF HERBAL SKIN CREAM FOR WOUND HEALING

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In partial Fulfillment for the award of degree of

MASTER OF PHARMACY

IN

PHARMACEUTICS

Submitted by

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This is to certify that the dissertation work entitled**"FORMULATION AND ELAVUATION OF SKIN CREAM FOR WOUND HEALING"** is a bonafide work done by **JamshiyaShamsu,**RVS college of Pharmaceutical Sciences,Sulur,Coimbatore,for the partial fulfillment of the University rules and regulations for the award of Master of Pharmacy in Pharmaceutics under my guidance and supervision during the academic year 2016-17.

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Sir,

Mrs.Jamshiya Shamsu, a M. Pharm (Pharmaceutics) candidate of RVS College Of Pharmaceutical Science, Sulur,Coimbatore is carrying out her project on the topic " Formulation And Evaluation Of Polyherbal Cream" in this industry during the period of July to December 2016.

Yours Faithfully,

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In the name of God, The Most Gracious, The Most Merciful…

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JAMSHIYA SHAMSU

DEDICATED

TO MY BELOVED

HUSBAND

AND

SON

ABSTRACT

Wound care is constantly evolving with the advances in medicine. Search for the ideal dressing material still continues as wound care professionals are faced with several challenges. Due to the emergence of multi-resistant organisms and a decrease in newer antibiotics, wound care professionals have revisited the ancient healing methods by using traditional and alternative medicine in wound management. People's perception towards traditional medicine has also changed and is very encouraging. In this study, creams were formulated based on the wound healing potential of herbal extracts and its evaluation. Herbal plants such as Azadirachtaindica, Samaderaindica, Curcuma longa.Glycyrrhizagalbraith and Aloe vera were selected. Selected plant parts are dried and extracted using alcohol . Quality evaluation of the product was assessed by using different evaluation methods. No change of the physical properties was observed; the pH was in a proper range (approximately pH 6). The formulations showed good spread ability, no evidence of phase separation and good consistency during this study period. It was found that the viscosity of the cream increases when decreasing the rate of shear so the viscosity of creams is inversely proportional to rate of shear (rpm). The creams were found to be stable during stability study according to ICH guidelines (40 ± 2 °C/ 75 ± 5 % RH) for 3 months. From the present study it can be concluded that it is possible to develop creams containing herbal extracts having wound healing property and can be used as the provision of a barrier to protect skin.

LIST OF ABBREVIATIONS

mm	Millimeter
cm	Centimeter
%	Percentage
e.g.	Example
pH	Hydrogen ion concentration
rpm	Rotations per minute
ICH	International Conference on Harmonization
o/w	Oil in water
w/o	Water in oil
WHO	World Health Organization
UV	Ultra Violet
ml	Milliliter
nm	Nanometer
DNA	Deoxyribonucleic acid
ft	Feet
etc.	Etcetera
in.	Inch
BC	Before Christ
AD	Anno Domini
min	Minute
gm	Gram
RH	Relative humidity
sec	Second
°C	Degree Celsius

°F	Degree Fahrenheit
µl	Micro liter
HPTLC	High performance thin layer chromatography
λ_{max}	Wave length of maximum absorption
hr.	Hour
mg	Milligram
µg	Microgram
S.No.	Serial number
Ext.	Extract

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AzadirachtaindicaSamaderaindica Curcuma longaGlycyrrhizagalbraith Aloe vera

Figure 1: Picturisation of the formulation

1. INTRODUCTION

Creams are the semisolid dosage forms and intended for topical application to the skin, placed on the surface of eye, or used nasally, vaginally or rectally for therapeutic or protective action or cosmetic function. These preparations are used for the localized effects produced at the site of their application by drug penetration in to the underlying layer of skin or mucous membrane. These products are designed to deliver drug into the skin in treating dermal disorders, with the skin as the target organ

Creams are semi-solid emulsions of oil and water. They are divided into two types: oil-in-water (O/W) creams which are composed of small droplets of oil dispersed in a continuous phase, and water-in-oil (W/O) creams which are composed of small droplets of water dispersed in a continuous oily phase. Oil-in-water creams are more comfortable and cosmetically acceptable as they are less greasy and more easily washed off using water. Water-in-oil creams are more difficult to handle but many drugs which are incorporated into creams are hydrophobic and will be released more readily from a water-in-oil cream than an oil-in-water cream. Water-in-oil creams are also more moisturising as they provide an oily barrier which reduces water loss from the stratum corneum, the outermost layer of the skin.

World Health Organization (WHO) as well our country has been promoting traditional medicine because they are less expensive, easily available and comprehensive, especially in developing countries.

It is also true that eight percent of the world's population relies on medicinal plants for their primary health care. Whole world including the developed country recognized the importance of traditional medicine and has treatment strategies, guidelines and standard for ethno medicine.

The manifestations of skin diseases are many and many at times the treatment is to be continued for a long time. The need for a safe and effective herbal skin cream is to treat various skin diseases likewounds, acne vulgaris, cracks, psoriasis and various types of skin diseases.

Although various types of cream is considered for wound healing but these are still appears to be limited in rate of tissue regeneration. Hence after a depth review regarding pathogenesis as well as different traditional and alternative therapy for wound healing.

The basic idea of skin care lies deep in the Rigveda, Yajurveda, Ayurveda, Unani and Homeopathic system of medicine. In this modern era, the knowledge and experience of usage of herbs are being blend with advanced cosmetic technology to develop a safe and effective product, which has wider range of people acceptability.

1.1 Wound healing

Wound is defined simply as the disruption of the cellular and anatomic continuity of a tissue. Wound may be produced by physical, chemical, thermal, microbial or immunological insult to the tissue. Wound healing is the process by which skin or other body tissue repairs itself after trauma. The process of wound healing consists of integrated cellular and biochemical events leading to reestablishment of structural and functional integrity with regain of strength of injured tissue.

Clinically, one often encounters non-healing, under-healing or over healing. Therefore the aim of treating a wound is to either shorten the time required for healing or to minimize the undesired consequences. Attention should be directed towards discovering an agent, which will accelerate wound healing either when it is progressing normally, or when it is suppressed by various agents like corticosteroids, anti-neoplastics, or non- steroidal anti-inflammatory agents.

Medical treatment of wound includes administration of drugs either locally (topical) or systemically (oral or parenteral) in an attempt to aid wound repair. The topical agents used include antibiotics and antiseptics , desloughing agents (chemical debridement, e.g. hydrogen peroxide, eusol and collagenase ointment) , wound healing promoters e.g. tretinoin, aloe vera extract, honey, comfrey, benzoyl peroxide, chamomilia extract, dexpanthenol, tetrachlordecaxide solution, clostebol acetate and the experimental cytokines.

Various growth factors like platelet derived growth factor, macrophage derived growth factor, monocyte derived growth factor etc. are necessary for the initiation and promotion of wound healing. Many substances like tissue extracts , vitamins & minerals and a number of plant products have been reported by various workers, to possess pro-healing effects. Wound healing herbals encourage blood clotting, fight infection and accelerate the healing of wounds.

Certain**examples** for wound healing herbs are given below:

a) Aloe vera

Aloe, a native to Africa, is also known as “lily of the desert” or the plant of immortality. Its name was derived from the alloeh meaning “bitter” because of the bitter liquid found in its leaves. Egyptians recorded use of this herbal plant in treating burns, infections and parasites as early as 1500B.C..It’s clear gel has a dramatic ability to heal wounds, ulcers and burns by forming a protective coating on the affected areas and speeding up the healing process. The fresh plant contains 96% of water and rest is essential oil, amino acids, minerals, vitamins, enzymes and glycoproteins. Various constituents of Aloe vera have been shown to have anti-inflammatory activity. They also stimulate wound healing. Some clinical reports suggest topical Aloe vera gel is useful in healing minor burns and that such application of the gel is harmless

as hypersensitive reactions to it are rare. However, in some severe burns, aloe gel may actually impede healing.

b) Azardirachtaindica

It is commonly called as Neem and the plant has diverse medicinal properties. Neem oil contains margosic acid, glycerides of fatty acids, butyric acid and trace of valeric acid. Various active principles are nimbidin, nimbidal, azardirachtin, nimbin, azadirine, gedunin, salanin. They have diverse medicinal activities.

Neem oil is especially beneficial for curing skin ailments. Oil is used for dressing for foot ulcers, eczema and skin diseases like ringworm, scabies and mange in dogs. It is a powerful insect repellant, anti-bacterial, anti-fungal, anti-viral, anti-inflammatory and also strengthens the body's overall immune responses. Neem oil contains fatty acids which build collagen, promote wound healing and maintain the skin's elasticity. The active ingredients of neem oil help in the process of wound healing and the skin is able to retain its suppleness as the wounds heal. Neem oil has a high content of essential fatty acids. They keep the site moist and give a soft texture to the skin during the healing process. Alcoholic extract of neem is useful in eczema, ringworm and scabies. Neem leaf extracts and oil from seeds has proven anti-microbial effect. This keeps any wound or lesion free from secondary infections by microorganisms. Clinical studies have also revealed that neem inhibits inflammation as effectively as cortisone acetate, this effect further accelerates wound healing.

c) Lantana camara

Lantana camara Linn, a shrub native of tropical America has completely been naturalized in many parts of India as an ornamental plant. The plant has abortificient, antimalarial, anti-inflammatory and wound healing properties. The hydro-alcoholic extract and fresh juice of leaves have favoured wound contraction. The plant is potentially toxic and its toxicities include nephrotoxicity, hepatotoxicity, photosensitization, dermatitis, intestinal haemorrhage, therefore, the use of this plant in whole or any part thereof needs to be carefully regulated until the alarming toxic principles of the plant are properly identified and removed.

Plants or chemical entities derived from plants need to be identified and formulated for treatment and management of wounds.

d) Helianthus annus Linn.

An ornamental annual herb, with erect, rough and hairy stem is common in Indian Gardens in swampy areas. In traditional medicine the plant is used by tribals for inflammation of eyes, sores, dysuria, colic, tiger bites and bone fractures. In a study the alcoholic extract of whole plant of H. annus applied in the form of an ointment on the excised wound of rat led to a significant reduction in total healing period. This has been confirmed by histology where earlier appearances of fibroblasts were seen. Early appearance and higher accumulation of muco-polysaccharides has been stated as indicators of hastened repair.

e) Jasminumauriculatum

A small herb found in south India and the western peninsula. The alcohol free defatted extract of J. auriculatum leaves has been reported to contain lupeol and jasminol . Juice of leaves of J. auriculatum has been shown to be beneficial in wound healing. The juice when applied in the form of jelly, locally on linear uniform excised wound in rats is found to promote wound healing. This has been assessed by histological, biochemical and contraction rate studies . Fresh juice of the leaves showed an increase and early gain of the tensile strength in the linear wounds in rats. The study indicated that collagenation contributed to improved tensile strength in the early phase of healing. Ghee medicated with J. auriculatum, on topical application accelerated the healing time of second degree burn wounds in rats up to six days. The mucopolysaccharide accumulation was significantly higher in group treated with medicated ghee.

f) Curcuma longa Linn.

Commonly known as turmeric and haldi in Hindi. C. longa has been reported to possess anti-bacterial, anti-fungal and anti-inflammatory activities . The part used are rhizomes and it contains curumin (diferuloyl methane), turmeric oil or turmerol and 1,7-bis, 6-hepta-diene-3, 5-dione. Curcumin has potent anti-inflammatory and analgesic activities .
Volatile oil isolated from C. longa also exhibits antibacterial and potent anti-inflammatory activity. Curcuma longa also contains protein, fats, vitamins (A, B, C etc) all of which have an important role in would healing and regeneration. Turmeric has been used for treating the wounds in the rats . The anti-inflammatory property and the presence of vitamin A & proteins in turmeric result in the early synthesis of collagen fibers by mimicking fibroblastic activity . Juice of the fresh rhizome is commonly applied to recent wounds, bruises & leech bites. A paste of turmeric & leaves of Justicaadhatoda with cow urine is rubbed on skin affected with prurigo& eczema. It can also be mixed with ginger oil to prevent skin eruptions.

g) Cedrusdeodara

Its oil has been reported to possess anti-inflammatory and anti-microbial activities. Cedrusdeodarahas also shown wound healing properties and is particularly useful in infective wounds.

h)Tridaxprocumbens

The plant is a native of tropical America and naturalized in tropical Africa, Australia and Asia including India. Leaf of Tridaxprocumbens mainly contains crude protein (26%), crude fiber (17%), soluble carbohydrate (39%) and calcium oxide (5%). The juice of the leaves of this plant is used by villagers to arrest bleeding from cuts and bruises in animals. This juice accelerates two phases of healing namely epithelization and collagenization; however it retards scar formation and granulation.

1.2 Human skin

The skin is the outer covering of the body. It is the largest organ of the integumentary system. The skin has multiple layers of ectodermal tissue and guards the underlying muscles, bones, ligaments and internal organs. Human skin is similar to that of most other mammals, except that it is not protected by a pelt. Though nearly all human skin is covered with hair follicles, it appears hairless. There are two general types of skin, hairy and globous skin. The adjective cutaneous literally means "of the skin". Skin plays a key role in protecting (the body) against pathogens and excessive water loss. Its other functions are insulation, temperature regulation, sensation, synthesis of vitamin D, and the protection of vitamin B folates. Severely damaged skin will try to heal by forming scar tissue.

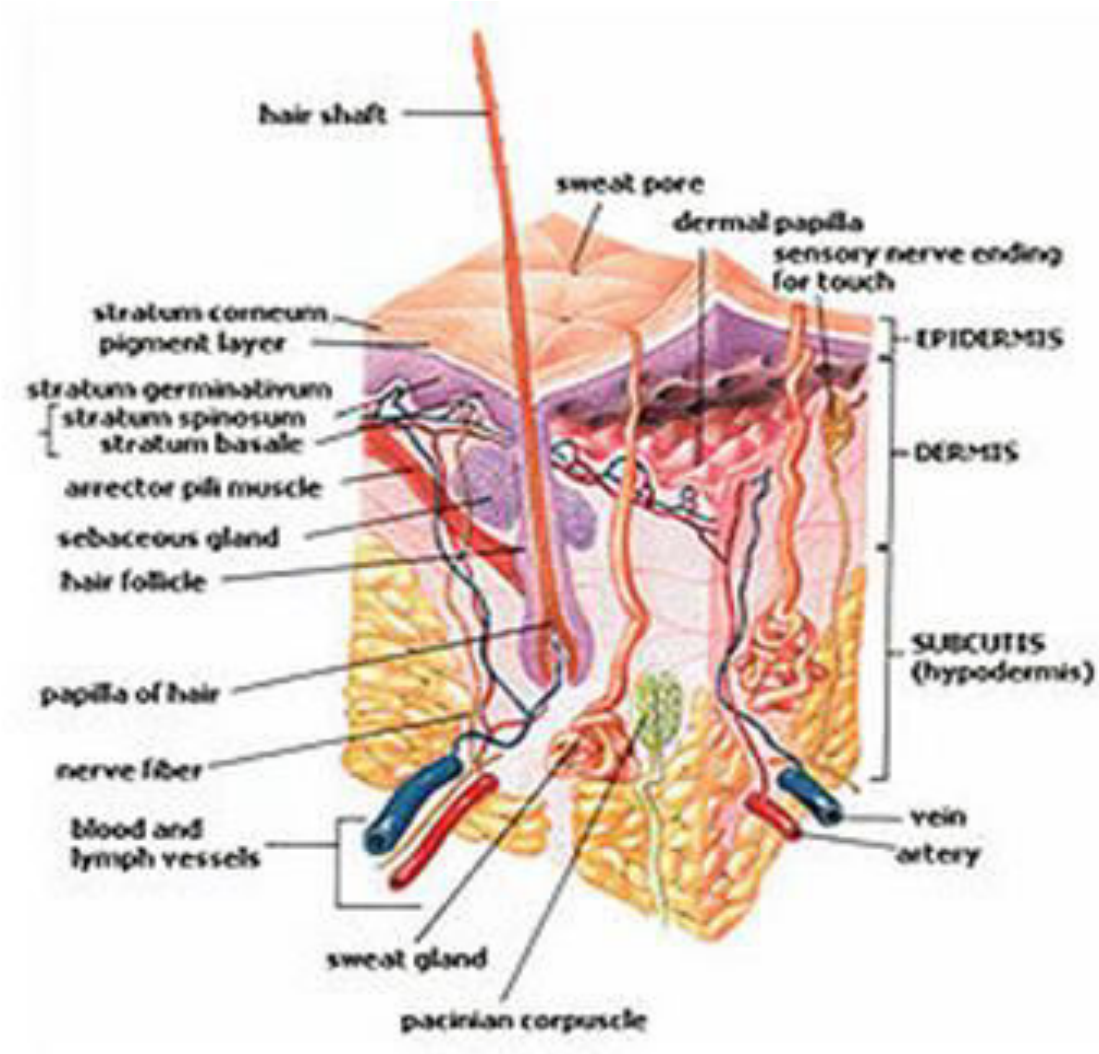


Figure 2: Structure of the human skin

1.2.1 Skin components

Skin has mesodermal cells, pigmentation, or melanin provided by melanocytes, which absorb some of the potentially dangerous ultraviolet radiation (UV) in sunlight. It also contains DNA-repair enzymes that help reverse UV damage, and people who lack the genes for these enzymes suffer high rates of skin cancer. One form predominantly produced by UV light, malignant melanoma, is particularly invasive, causing it to spread quickly, and can often be deadly. Skin pigmentation varies among populations in a striking manner.

1.2.2 Functions of skin

Skin performs the following functions:

a) **Protection:** an anatomical barrier from pathogens and damage between the internal and external environment in bodily defence, Langerhans cells in the skin are part of the adaptive immune system.

b) **Sensation**: contains a variety of nerve endings that react to heat and cold, touch, pressure, vibration, and tissue injury, see somatosensory system and haptics.

c) **Heat regulation**: the skin contains a blood supply far greater than its requirements which allows precise control of energy loss by radiation, convection and conduction. Dilated blood vessels increase perfusion and heat loss, while constricted vessels greatly reduce cutaneous blood flow and conserve heat.

d) **Control of evaporation**: the skin provides a relatively dry and semi-impermeable barrier to fluid loss. Loss of this function contributes to the massive fluid loss in burns.

e) **Aesthetics and communication:** others see our skin and can assess our mood, physical state and attractiveness.

f) **Storage and synthesis:** acts as a storage centre for lipids and water, as well as a means of synthesis of vitamin D by action of UV on certain parts of the skin.

g) **Water resistance:** The skin acts as a water resistant barrier so essential nutrients aren't washed out of the body.

1.3 Skin layers

Skin is composed of three primary layers:

· The **epidermis**, which provides waterproofing and serves as a barrier to infection.

· The **dermis**, which serves as a location for the appendages of skin.

· The **hypodermis** subcutaneous adipose layer.

1.3.1 Layers of epidermis

Epidermis is divided into several layers where cells are formed through mitosis at the innermost layers. They move up the strata changing shape and composition as they differentiate and become filled with keratin. They eventually reach the top layer called stratum corneum. This process is called keratinisation and takes place within weeks. The outermost layer of the epidermis consists of 25 to 30 layers of dead cells.

Sub layers

Epidermis is divided into the following 5 sub layers or strata:

- Stratum corneum
- Stratum lucidum
- Stratum granulosum
- Stratum spinosum
- Stratum germinativum

1.4 Diseases of skin

a)Vitiligo

Vitiligo is a condition in which areas of skin lose their normal pigment and so become white. It is common, and affects about 1% of the world's population. The pigment that gives your skin its normal colour is melanin, which is made by cells known as melanocytes.

b) Scabies

Scabies is a common and very itchy skin condition caused by human scabies mites. It can affect people of any age but is most common in the young and the elderly. The mites that cause scabies are tiny parasites, smaller than a pinhead. The rash of scabies is a mixture of scratch marks and red scaly areas; later it can become infected and develop small pus spots.

c) Rosacea

Rosacea is a common rash, found on the central part of the face, usually of a middle-aged person. A tendency to flush easily is followed by persistent redness on the cheeks, chin, forehead and nose. The cause of rosacea is not fully understood, but many think that the defect lies in the blood vessels in the skin of the face, which dilate too easily.

d) Psoriasis

Psoriasis is a common skin problem affecting about 2% of the population. It occurs equally in men and women, at any age, and tends to come and go unpredictably. It is not infectious, and does not scar the skin. The skin is a complex organ made up of several different layers.

e) Melanoma

Cutaneous malignant melanoma is a cancer of the pigment cells of the skin. If it is treated early, the outlook is usually good. It is not contagious. The word 'melanoma' comes from the Greek word 'melas', meaning black. Melanin is the dark pigment that gives the skin its natural colour.

f)Eczema (Atopic Eczema)

Atopic eczema is an inflammatory condition of the skin. Atopic is the term used to describe conditions such as eczema, asthma, seasonal rhinitis and hay fever, which often have a genetic basis. Eczema is the term used to describe changes in the upper layer of the skin that include redness, blistering, oozing, crusting, scaling, thickening and sometimes pigmentation.

1.5 CLASSIFICATION OF HERBAL DRUG ON THE BASIS OF THEIR ACTION

Our skin is our body's first line of defence against microbial invaders. Using herbs for skin is one of the best ways we can take care of our skin. The skin contains one third of the body's blood supply.

A healthy person has a smooth, supple, glowing complexion. A skin patient's skin may be pull of blemishes or rough patches, their complexion may be grey, translucent, and waxy.

The top supplement for our skin is water. Using herbs for skin help your skin and keep it in good condition.

a) Skin Cleansers for Smoothing and Astringency

* Lavender
* Rosemary
* Rose
* Calendula

b) All Purpose Skin Healers

* Chamomile
* Aloe
* Allantion

c) Essential Oil for Skin

* Lavender oil
* Tea leaves oil

d) Abrasives and Exfoliate

* Apricot
* Oatmeal
* Horsetail

e) Fresheners and Toners

* Lavender

* Lemon balm
* Mint
* Calendula, rose
* Chamomile

f) Astringent and Antibacterial

* Aloe
* Dandelion leaves
* Tea tree oil

g) Moisturizers

* Calendula
* Rosemary
* Chamomile
* Lavender
* Marigold

h) Relive Inflammation

* Lavender
* Rose water
* Lady mantle

i) Blemishes

* Basil , Tea
* Comfrey

j) Burns

* Aloe
* Calendula
* Acne
* Artemisia
* Basil

* Pea
* Pumpkin
* Onion

k) Anti aging Treatment

* Ginseng
* Green and black tea
* Grape seed extract

l) Anti-inflammatory Treatment

* Chamomile
* Fenugreek
* Jojoba
* Liquorice root
* Red clover

m) Skin protection

* Aloe Vera
* Oats like oatmeal, bran

1.6HERBAL PLANT USED IN SKIN CARE

- Common Name- **Ghikanawar**

Botanical Name -Aloebarbadensis

Family-Liliaceae

Chemical Constituents- Anthraquinoneglycoside, aloincarboxypeptidase salicylate components, c- glycosychromone.

Uses-Leaf juice is applied on skin for smoothness, healing, controlling skin burns & sun burns.

- Common Name- **Garlic**

Botanical Name - Allium sativam

Family- Aliaceae

Chemical Constituents- Alliin, allicin, ajoene, vinyldithins, Diallyl disulphide, trisulphide, antioxidant,t-diallyl tetra, penta, hexa&hepta sulphides.

Uses- Oil is used to treat sores, pimples and acne.

- Common Name- **Vetiver,cuscus, khus**

Botanical Name –Andropogonmuricatus

Family-Poaceae

Chemical Constituents- Essential oil contains vetiselinenol of khusimol, sesquiterpenoids-vetidiol

Uses- It is used to treat acne, cuts, eczema, dry skin, wounds, and aging skin. Powdered root paste is used to cure irritated skin and allergies.

- Common Name- **Bear berry**

Botanical Name -Acrtostaphylosurva – ursi

Family-Eriaceae

Chemical Constituents- Arbutin,tannins,flavonolglucoside, isoquercities, methyl arbutin.

Uses-Skin whitener, melanin inhibitor, it is used for treat skin pigmentation, sunburns, freckles.

- Common Name- **Neem, margosa**

Botanical Name - Azadirachtaindica

Family-Meliaceae

Chemical Constituents- Tetranortriterpenoids ,azadirachtin, diterpenes.

Uses- It cures wounds, leprosy, skin diseases like acne, ulcers, hair problems.

- Common Name- **Flame of the forest, butea gum, Bengal kino**

Botanical Name-Buteafrondosa

Family-Fabaceae

Chemical Constituents- Flavonoids, glucosides – butin, butrin, isobutrin&palastrin, coreopsin, mono spermoside , and sulphurein&chalcones.

Uses- Leaves extract is useful in pimples and seed extract forfungal infection and bruises, flower extract for hair and skin conditioning.

- Common Name- **Pot-marigold, marigold, calendula**

Botanical Name -Calendula officinalis

Family-Asteraceae

Chemical Constituents-Triterpenes, sterols, flavonoids, carotenes, bitter, glycosides, resins, volatile oil, mucilage.

Uses Flower extract is used for smoothening hair. It is used to cure acne, inflammation, and aging.

- Common Name- **Green tea**

Botanical Name –Cammeliasinensis

Family-Theaceae

Chemical Constituents- Polyphenols, flavonoids, tannins, methyl xanthines

Uses- Anti-oxidant, anti-inflammatory, photo aging, anti-acne.

- Common Name- **Papaya, papaw**

Botanical Name -Carica papaya

Family-Caricaceae

Chemical Constituents- Enzymes-Papain &chymopapains.Alkaloidscarpine&pseudocarpine, xpressin

Uses- fruit pulp makes skin soft and removes blemishes. It can be used for treating wrinkles, sunspots, age spots, acne problems.

- Common Name- **Asiatic ,pennywort,Indian pennywort**

Botanical Name –Centellaasiatica

Family-Umbelliferae /Apiaceae

Chemical Constituents- Brahmoside, asiaticoside, thankuniside, hydrocotyline alkaloid, velarin.

Uses- Brahmoside, asiaticoside, thankuniside, Hydrocotyline alkaloid, velarin.

Whole plant extract is used for growth and maintenance of hair. It fights oxidation thereby improves skin firmness and elasticity

- Common Name-**Saffron crocus**

Botanical Name-Crocus sativus

Family-Iridaceae

Chemical Constituents- Crocin, pirosin, crocetin, carotenoids, riboflavin, thiamine, terpenes, xanthone.

Uses- It is used to treat skin diseases and dresses bruises. It moisturizes, soothes and promotes fairness of skin. It treats dandruff and nourishes hair.

- Common Name – **Turmeric**

Botanical Name –Curcuma longa

Family-Zingiberaceae

Chemical Constituents- Curcuminoids, phenolic diarylheptanoids, curcumin, monodesmethoxycurcumin, turmerone, serquiterpene ketones.

Uses- Rhizome powder possesses anti-inflammatory and antioxidant properties. It is used in treatment of skin and hair problems.

- Common Name- **Maiden hair tree,kew tree**

Botanical Name- Gingko biloba

Family-Ginkgoaceae

Chemical Constituents –Flavone, glycosides, quercetin, kaempferol, terpenes.

Uses- Anti-oxidant, anti-inflammatory

- Common Name- **Licorice,liquorice**

Botanical Name –Glycirrhizaglabra

Family-leguminosae

Chemical Constituents- Glycyrrhizin, glycyrrhetincacid,isoflavonoids, chalcones, coumarins, triterpenoids

Uses- Skin conditioning, smoothening, soothing, hair conditioning.

- Common Name- **Lavender**

Botanical Name –Lavendulavera

Family-Labiatae/lamiaceae

Chemical Constituents- Essential oil- linalool, linalyl acetate, borneol, camphor, lavandulyl ,caryophyllene, limonene. Aerial parts-ursolic acid, lactone, betulin, betuliinic acid, 3 β formylursolic acid.

Uses- It is cytophylactic and antiaging, refresher; it improves hair growth and texture. It cures many hair problems like dandruff.

- Common Name- **Chamomile**

Botanical Nam –Matricaria chamomile

Family-Compositae/Asteraceae

Chemical Constituents- α-bisabolol, azulenes,-chamazulene, guiazuline&matricine, flavonoids, patuletin, quercetin, spiroethers&coumarins

Uses- Flowers are used as Hair tonic. Leaves extract is used for skin problems.

- Common Name- **Mint**

Botanical Name- Menthaarvensis

Family-Labiatae

Chemical Constituents- Menthol, menthone. α&β- pinene, α-thujene, l-limonene, β-phellandrene, furfural, methylcyclohexanone,camphene.

Uses- Acts against pigmentation and skin diseases and has as moisturizing, cooling, antiperspirant, anti-aging properties.

- Common Name- **Mango**

Botanical Name –Mangiferaindica

Family-Anacardiaceae

Chemical Constituents- Citric and ascorbic acids, carotenoids ,phenolic compounds, flavonoids,β-amyrins, gallotannin, glucogallin, indicol, taraxerol, friedelin, lupeol.

Uses- It soothes, moisturizes, andregenerates skin cells. It is used to treat skin diseases.

- Common Name- **Camphor basil**

Botanical Name –Ocimum sanctum

Family-labiatae/ lamiaceae

Chemical Constituents – Camphor, pinene, limonene,terpinolene, myrcene, β-phellandrene,linalool,camphene, p-cymene, borneol or α-selinene.

Uses-Leaf extract is useful to control skin infection and rejuvenation. Used as skin and hair conditioners.

- Common Name- **Almond**

Botanical Name - Prunusamygdalus

Family-Rosaceae

Chemical Constituents- Amandin, globulin, Oleum Amygdalae, oleic, palmitin, linoleic acids

Uses- It is used for moisturizing and nourishing skin. It nourishes hair and promotes growth. Kernel extract is used in sun creams.

- Common Name- **Damask rose**

Botanical Name –Rosa damascene

Family-Rosaceae

Chemical Constituents- Quercetin, Kaempferol, Cyanidin, Lycopene, Rubixathin ,Zeaxanthin, Xanthophyll, Citronellol, Geraniol, β-phenylethanol, eugenol.

Uses- Essential oil from flowers is used for protection from sun burns and skin smoothening.

- Common Name- **White sandal wood**

Botanical Name –Santalum album

Family-Santalaceae

Chemical Constituents- Stillingia oil, palmitic, oleic, ellagic, galicacids,isoquercetrin, phloroacetophenone, 2, 4-dimethylether, moretenone, moretenol, tri terpene

Uses- Paste of hardwood is used in face packs. Essential oil for protection from sunburns. It is an anti-oxidant.

- Common Name- **Sesame, gingelly**

Botanical Name- Sesamumindicum

Family-Pedaliaceae

Chemical Constituents- Sterols, lignans, sesamin, nitrolactone,sesamolin, thiamine, niacin, riboflavin, nicotinic acid, vitA, pyridoxine & ascorbic acid

Uses- Seed extract is used for skin protection and rejuvenation. Seed oil is used as base for hair oils.

- Common Name- **Cocoa, Theobroma**

Botanical Name - Theobroma cacao

Family-Sterculiaceae

Chemical Constituents- Methylxanthine, sulphur, magnesium, phenylethylamine, anandamide.

Uses- Skin softener and conditioner, moisturizes, anti-wrinkle effect, restores flexibility.

- Common Name- **Winter cherry**

Botanical Name - Withaniasomnifera

Family-Solanaceae

Chemical Constituents- Alkaloids-withanine,withananine, pseudowithanine, somnine, somniferinine. withaferin-A.

Uses- Whole plant extract is used for skin cleansing and antioxidant.

- Common Name- **Watermelon**

Botanical Name -Citrullus vulgaris

Family-Cucurbitaceae

Chemical Constituents- Citrullin, arginine, triterpene, bryonolic acid

Uses- Additives in sun creams,seed oil works as restorative and nourishing for skin, Itcures acne, sebum secretion.

1.7 Examples for wound healing ointments

Everybody gets a cut or a skin abrasion now and then. Having a soothing cream or ointment on hand is usually enough to treat minor skin wounds. There are numerous products available, all made with different ingredients. And all are also great for healing more sizable cuts that don't require stitches.

a)Zinc Ointment

Zinc ointment is an old-time favourite for cuts, abrasions, skin irritations and diaper rash, according to Drugs.com. Zinc ointment is available in tubes--as a plain, unscented ointment--or mixed in diaper rash creams and other First-Aid creams.

b) Antibiotic Ointments

An antibiotic cream or ointment is used for treating cuts and abrasions. Try Neosporin, Polysporin or Ultra Mide, all available in grocery and drug stores. These ointments are said to protect against bacteria invading a wound. They also help to reduce scarring.

c) Vitamin E Oil

Vitamin E oil applied directly on a cut aids healing and helps to prevent scarring, says EarthClinic.org. Just prick the tip of the tube with a pin and squeeze to apply.

d)A&D Ointment

Another favourite treatment that soothes and heals minor skin irritations and cuts is A&D ointment. A&D ointment contains vitamins.

e)Cortisone Ointment

Cortisone ointments help reduce inflammation, protect against infection and heal most skin abrasions, cuts and irritations. Cortisone ointment comes in different strengths. A prescription is required for higher potencies.

f)Aloe Vera Gel

Aloe vera gel is an excellent remedy, reports EarthClinic.com. It is used for healing skin problems and is cool and soothing. It can be used on burns and sunburns, as well as open

wounds. Buy aloe vera gel at health food stores in bottles or, if you have an aloe vera plant, just break off a piece of the fleshy leaf and give it a little squeeze.

g) Aquaphor Healing Ointment

Aquaphor Healing Ointment protects the skin and enhances the natural healing process. It is great for cracked, dry or chafed skin, minor cuts and burns, sensitive skin and skin irritations from laser treatments and radiation therapy.

f) Good Samaritan Healing Ointment

Good Samaritan Healing Ointment's active ingredients are blended into a soothing lanolin base that protects skin and promotes healing. This salve includes among its active ingredients: zinc oxide to soothe broken skin and oxyquinolinesulfate to prevent infection.

The present study is to formulate and evaluate ofa herbal skin cream which will be effective and has better rate of tissue regeneration. The herbal cream that is planned to be formulated for wound healing will be oil/water (O/W)emulsion type which will be less oily, less greasy and less sticky in nature so that patient compliance is more and will be beneficial for all kind of people in our society. After thorough review of ayurvedic system of medicine selected the following herbs to formulate the cream.

- Azadirachtaindica(anti-fungal, treat skin diseases,) (LEAF)
- Samaderaindica (antifungal , antibacterial) (LEAF)
- Curcuma longa (used in wound healing, and antiseptic) (RHIZOME)
- Glycyrrhizagalbraith (antibacterial) (ROOT)
- Aloe vera(regenerate tissue) (WHOLE PLANT)

Aim and objective

2. AIM AND OBJECTIVE

Natural products from plants are rich sources used for treating a number of diseases. Most of the herbal drugs are a mixture of a number of plant ingredients. Their synergistic effect increases the efficacy of the drug in curing the diseases. In this modern era, the knowledge and experience of usage of herbs are being blend with advanced formulation technology to develop a safe and elegant herbal product, which has wider range of people acceptability. Formulation of medicinal plant in the form of a cream will be made by mixing of plant extracts in different proportions and tested for wound healing activity. Methanolic extracts of plants such as Azadiractaindica (leaf),Samaderaindica (leaf),Curcuma longa (rhizome),Glycyrrhizagalbraith (root), Aloe vera (whole plant) are used for formulation of herbal skin cream for wound healing .Then the formulated skin cream is evaluated for parameters like physical properties, pH , viscosity, spreadability and stability of the formulated cream.

2.1 OBJECTIVE OF THE STUDY

The purpose of the present investigation is to formulate and evaluate a herbal skin cream for wound healing. Herbal plants likeAzadiractaindica ,Samaderaindica,Curcuma longa ,Glycyrrhizagalbraith, Aloe vera are used for formulation of herbal skin cream for wound healing .Then the formulated skin is evaluated for parameters like physical properties, pH , viscosity, spreadability and stability of the formulated cream. The excipient concentrations are varied in order to find out the best formulation with better spreadability, viscosity ,stabilityetc.

2.2 Plan of work

a) Collection of the plants and authentication.

b) Extraction of the selected plants.

c) Preliminary phyto- chemical investigation of methanolic extract of the plants.

d) Formulation andevaluation ofthe herbal skin cream using the extracts.

2.2.1 Formulation of the herbal skin cream

- Humectants
- Solvents
- Emollient agents
- Spreading agents
- Gelling agents (Thickening agents)
- Nourishing agent
- Preservatives
- Film formers
- Healing agents
- Antioxidants

2.2.2 Evaluation of cream

- Physical properties
- Rheology test
- Determination of pH
- Spreadability Test
- Peroxide Stability test
- Test for stability
- Skin Irritation test

3. REVIEW OF LITERATURE

Since the beginning of human civilization, medicinal plants have been used by mankind for its therapeutic value. Nature has been a source of medicinal agents for thousands of years and an impressive number of modern drugs have been isolated from natural sources. Many of theseisolations were based on the uses of the agents in traditional medicine.

The plant-based, traditional medicine systems continues to play an essential role in health care, with about 80% of the world's inhabitants relying mainly on traditional medicines for their primary health care (Owolabi*et al*., 2007).

India has several traditional medical systems, such as Ayurveda and Unani, which has survived through more than 3000 years, mainly using plant-based drugs. The *materiamedica*of these systems contains a rich heritage of indigenous herbal practices that have helped to sustain the health of most rural people of India. The ancient texts like Rig Veda (4500-1600 BC) and Atharva Veda mention the use of several plants as medicine.

The books on ayurvedic medicine such as *CharakaSamhita*and *SusrutaSamhita*refer to the use of more than 700 herbs (Jain, 1968).

According to the World Health Organization (WHO, 1977) "a medicinal plant" is any plant, which in one or more of its organ contains substances that can be used for the therapeutic purposes or which, areprecursors for the synthesis of useful drugs. This definition distinguishesthose plants whose therapeutic properties and constituents have beenestablished scientifically and plants that are regarded as medicinal but which have not yet been subjected to thorough investigation. The term "herbal drug" determines the part/parts of a plant (leaves, flowers, seeds, roots, barks, stems, etc.) used for preparing medicines (Anonymous, 2007a). Furthermore, WHO (2001) defines medicinal plant as herbal preparations produced by subjecting plant materials to extraction, fractionation, purification, concentration or other physical or biological processes which may be produced for immediate consumption or as a basis for herbal products.

Medicinal plants are plants containing inherent active ingredients usedto cure disease or relieve pain (Okigbo*et al*., 2008).

The use of traditional medicines and medicinal plants in most developing countries as therapeutic agents for the maintenance of good health has been widely observed (UNESCO, 1996). Modern pharmacopoeia still contains at least 25% drugs derived from plants and many others, which are synthetic analogues, built on prototype compounds isolated from plants.

Interest in medicinal plants as a re-emerging health aid has been fuelled by the rising costs of prescription drugs in the maintenance of personal health and well being and the bio prospecting of new plant-derived drugs (Lucy and Edgar, 1999).

The ongoing growing recognition of medicinal plants is due to several reasons, including escalating faith in herbal medicine (Kala, 2005). Furthermore, an increasing reliance on the use of medicinal plants in the industrialized societies has been traced to the extraction and development of drugs and chemotherapeutics from these plants as well as from traditionally used herbal remedies (UNESCO, 1998).

The medicinal properties of plants could be based on the antioxidant, antimicrobial antipyretic effects of the phytochemicals in them (Cowman, 1999; Adesokan*et al*., 2008).

According to World Health Organization, medicinal plants would be the best source to obtain a variety of drugs. Therefore, such plants should be investigated to better understand their properties, safety and efficacy (Nascimento*et al*., 2000).

Medicinal plants produce bioactive compounds used mainly formedicinal purposes. These compounds either act on different systems ofanimals including man, and/or act through interfering in the metabolism of microbes infecting them. The microbes may be pathogenic or symbiotic. In either way the bioactive compounds from medicinal plants play a determining role in regulating host-microbe interaction in favour of the host. So the identification of bioactive compound in plants, their isolation, purification and characterization of active ingredients in crude extracts by various analytical methods is important. The medicinal properties of plants could be based on the antioxidant, antimicrobial, antipyretic effects of the phytochemicals in them (Cowman, 1999; Adesokan*et al*., 2008)

The instant rising demand of plant-based drugs is unfortunately creating heavy pressure on some selected high-value medicinal plant populations in the wild due to over-harvesting. Several of these medicinal plant species have slow growth rates, low population densities, and narrow geographic ranges (Nautiyal*et al.,* 2002), therefore they are more prone to extinction (Jablonski, 2004). Conversely, because information on the use of plant species for therapeutic purpose has been passed from one generation to the next through oral tradition, this knowledge of therapeutic plants has started to decline and become obsolete through the lack of recognition by younger generations as a result of a shift in attitude and ongoing socioeconomic changes (Kala, 2000). Furthermore, the indigenous knowledge on the use of lesser-known medicinal plants is also rapidly declining.

Continuous erosion in the traditional knowledge of many valuable plants for medicine in the past and the renewal interest currently, the need existed to review the valuable knowledge with the expectation of developing the medicinal plants sector (Kala *et al*., 2006).

In India, the ayurvedic system has described a large number of suchmedicines based on plants or plant product and the determination of their morphological and pharmacological or pharmacognostical characters can provide a better understanding of their active principles and mode of action. However a large number of tropical plants have not been studied in detail for their chemical constituents, pharmacological properties of the extracts, and their pharmacognostical characterization including DNA sequencing etc. In the present review focused on the development and evaluation of herbal skin cream.

4. DRUG AND POLYMER PROFILE

4.1 Azadirachtaindica

Figure 3: Azadirachtaindica

Botanical Name(s): Azadirachtaindica
Common Name:
Marathi-KaduLimba
Hindi-Neem
Tamil-Vepu
Kingdom: Plantae
Division: Magnoliophyta
Order: Sapindales
Family: Meliaceae
Genus: Azadirachta
Species: A. indica
Popular Name(s): Indian Lilac, Margosa Tree
Parts Used: Leaves, Flower, Oil, Seed
Habitat: Grows throughout India.

Neem is a fast-growing tree that can reach a height of 15–20 metres (49–66 ft), and rarely 35–40 metres (115–131 ft). It is evergreen, but in severe drought it may shed most or nearly all of its leaves. The branches are wide and spreading. The fairly dense crown is roundish and may reach a diameter of 15–20 metres (49–66 ft) in old, free-standing specimens. The neem tree is very similar in appearance to its relative, the Chinaberry (*Meliaazedarach*).

The opposite, pinnate leaves are 20–40 centimetres (7.9–15.7 in) long, with 20 to 31 medium to dark green leaflets about 3–8 centimetres (1.2–3.1 in) long. The terminal leaflet often is missing. The petioles are short.

The (white and fragrant) flowers are arranged in more-or-less drooping axillarypanicles which are up to 25 centimetres (9.8 in) long. The inflorescences, which branch up to the third degree, bear from 150 to 250 flowers. An individual flower is 5–6 millimetres (0.20–0.24 in) long and 8–11 millimetres (0.31–0.43 in) wide. Protandrous, bisexual flowers and male flowers exist on the same individual tree.

The fruit is a smooth (glabrous), olive-like drupe which varies in shape from elongate oval to nearly roundish, and when ripe is 1.4–2.8 centimetres (0.55–1.10 in) by 1.0–1.5 centimetres (0.39–0.59 in). The fruit skin (exocarp) is thin and the bitter-sweet pulp (mesocarp) is yellowish-white and very fibrous. The mesocarp is 0.3–0.5 centimetres (0.12–0.20 in) thick. The white, hard inner shell (endocarp) of the fruit encloses one, rarely two, or three, elongated seeds (kernels) having a brown seed coat.

4.1.1Traditional medicinal use

Products made from neem trees have been used in India for over two millennia for their medicinal properties. Neem products are believed by Siddha and Ayurvedic practitioners to be anthelmintic, antifungal, antidiabetic, antibacterial, antiviral, contraceptive, and sedative. It is considered a major component in siddha medicine and Ayurvedic and Unani medicine and is particularly prescribed for skin diseases. Neem oil is also used for healthy hair, to improve liver function, detoxify the blood, and balance blood sugar levels. Neem leaves have also been used to treat skin diseases like eczema, psoriasis, etc.

Insufficient research has been done to assess the purported benefits of neem, however. In adults, short-term use of neem is safe, while long-term use may harm the kidneys or liver; in small children, neem oil is toxic and can lead to death. Neem may also cause miscarriages, infertility, and low blood sugar.

4.2 Samderaindica

Figure 4: Samaderaindica

Botanical name: Samaderaindica

Common name:

Malayalam: Njotta, Karinjotta

Kingdom- Plantae

Subkingdom- Tracheobionta

Super division- Spermatophyta

Division- Magnoliophyta

Class- Magnoliopsida

Subclass- Rosidae

Order- Sapindales

Family- Simaroubaceae

Genus – SamaderaGaertn

Species- SamaderaindicaGaertn

Habitat: Evergreen forests.

Usually rather rare, but locally common, in tidal swamp forest or periodically inundated forest. In lowland mixed dipterocarp forest it is usually found at elevations below 150 metres.

The tree is 60 feet or more in height, with many long, crooked branches covered with smooth, greyish bark, leaves 9 to 12 inches long, and flowers growing in small clusters, with rather thick, dull-white petals. The bark is usually found in pieces several feet long, the roots being long, horizontal, and creeping. Very often the outer bark has been removed, when it shows a pale yellowish or pinkish-brown surface. It is odourless, difficult to powder, and intensely bitter. It is usually imported from Jamaica, in bales.

4.2.1 Traditional medicinal use

- The bark is used in the treatment of fevers.
- The juice of the pounded bark is considered a cure for skin diseases.
- After maceration, or in decoction, the bark and wood are used as a febrifuge, tonic, stomachic and emmenagogue.
- The oil from the seeds is applied externally on rheumatic joints, and used as a liniment on bruises.

4.3 Curcuma longa

Figure 5: Curcuma longa

Botanical name: Curcuma longa

Common name:

Malayalam:Manjal

Kingdom: Plantae

(unranked): Angiosperms

(unranked): Monocots

(unranked): Commelinids

Order: Zingiberales

Family: Zingiberaceae

Genus: Curcuma

Species: C. Longa

Turmeric (*Curcuma longa*) is a rhizomatous herbaceousperennial plant of the ginger family, Zingiberaceae. It is native to southern Asia, requiring temperatures between 20 and 30 °C (68 and 86 °F) and a considerable amount of annual rainfall to thrive. Plants are gathered annually for their rhizomes and propagated from some of those rhizomes in the following season.

Turmeric is a perennialherbaceous plant that reaches up to 1 m (3 ft 3 in) tall. Highly branched, yellow to orange, cylindrical, aromatic rhizomes are found. The leaves are alternate and arranged in two rows. They are divided into leaf sheath, petiole, and leaf blade. From the leaf sheaths, a false stem is formed. The petiole is 50 to 115 cm (20 to 45 in) long. The simple leaf blades are usually 76 to 115 cm (30 to 45 in) long and rarely up to 230 cm (91 in). They have a width of 38 to 45 cm (15 to 18 in) and are oblong to elliptic, narrowing at the tip.

4.3.1 Traditional medicinal use

In Ayurvedic practices, turmeric has been used as an attempted treatment for a variety of internal disorders, such as indigestion, throat infections, common colds, or liver ailments, as well as topically to cleanse wounds or treat skin sores.

4.4 Glycyrrhizagalbraith

Figure 6: Glycyrrhizagalbraith

Botanical name: Glycyrrhizagalbraith

Common name: Iratimadhuram

Kingdom: Plantae

(unranked): Angiosperms

(unranked): Eudicots

(unranked): Rosids

Order: Fabales

Family: Fabaceae

Subfamily: Faboideae

Genus: Glycyrrhiza

Species: G. glabra

It is aherbaceousperennial, growing to 1 m in height, with pinnateleaves about 7–15 cm (2.8–5.9 in) long, with 9–17 leaflets. The flowers are 0.8–1.2 cm (⅓–½ in) long, purple to pale whitish blue, produced in a loose inflorescence. The fruit is an oblong pod, 2–3 cm (¾–1 1⁄6 in) long, containing several seeds. The roots are stoloniferous.

4.4.1 Traditional medicinal use

In traditional Indian medicine, liquorice is believed to "harmonize" the ingredients in a formula and to carry the formula to the 12 "regular meridians". Liquorice has been traditionally known and used as medicine in Ayurveda for rejuvenation. Liquorice extract is used as a home remedy for skin lightening.

4.4.2 Anti-bacterial Activity

Because of the presence of secondary metabolites such as saponins, alkaloids, flavonoids in hydro-methanolic root extract of Glycyrrhizaglabra, the extract exhibits potent antibacterial activity. In vitro studies have proved that aqueous and ethanolic extracts of liquorice show inhibitory activity on cultures of Staphylococcus aureusand Streptococcus pyogenes

4.5 Aloe vera

Figure 7: Aloe vera

Botanical name: Aloe barbadensis
Common name: Kattarvazha
Kingdom: Plantae
Clade: Angiosperms
Clade: Monocots
Order: Asparagales
Family: Asphodelaceae
Subfamily: Asphodeloideae
Genus: Aloe
Species: A. Vera

Aloe vera is a plantspecies of the genusAloe. It grows wild in tropical climates around the world and is cultivated for agricultural and medicinal uses. Aloe is also used for decorative purposes and grows successfully indoors as a potted plant.

It is found in many consumer products including beverages, skin lotion, or ointments for minor burns and sunburns.

Aloe vera is a stemless or very short-stemmed plant growing to 60–100 cm (24–39 in) tall, spreading by offsets. The leaves are thick and fleshy, green to grey-green, with some varieties showing white flecks on their upper and lower stem surfaces. The margin of the leaf is serrated and has small white teeth. The flowers are produced in summer on a spike up to 90 cm (35 in) tall, each flower being pendulous, with a yellow tubular corolla 2–3 cm (0.8–1.2 in) long. Like other Aloe species, Aloe vera forms arbuscularmycorrhiza, a symbiosis that allows the plant better access to mineral nutrients in soil.

4.5.1 Traditional medicinal use

Aloe vera is used in traditional medicine as a skin treatment. In Ayurvedic medicine it is called kathalai, as are extracts from agave. Early records of Aloe vera use appear in the Ebers Papyrus from the 16th century BC, and in Dioscorides' De Materiamedica and Pliny the Elder's Natural History – both written in the mid-first century AD. It is also written of in the Juliana Anicia Codex of 512 AD. The plant is used widely in the traditional herbal medicine of many countries.

Aloe Vera is a major medicinal plant when it comes to treating and protecting the skin. Used externally, it is very effective on burns and sunburn, as well as a variety of skin diseases (eczema, pruritus, psoriasis, acne) – it is extremely constructive and protective.

Aloe vera is good for irritated or inflamed skin. Aloevera helps repair your skin from the most tender of wounds. Aloevera helps speed the process of healing to burns and other wounds. Aloevera is hydrating, rejuvenating and toning for your skin. Aloevera moisturizes and softens your skin.

4.6 Stearic acid

Structure:

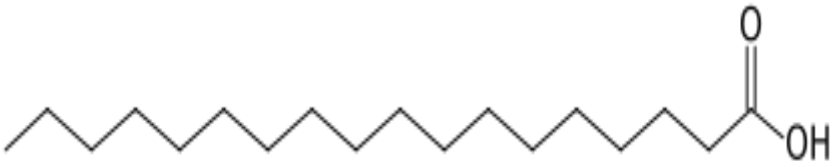


Figure 8: Structure of stearic acid

Table No.1: Properties of stearic acid

Form	White solid
Odour	Pungent, oily
Density	0.9408 g/cm^3 (20 °C)
Melting point	69.3 °C (156.7 °F; 342.4 K)
Boiling point	361 °C (682 °F; 634 K)

4.6.1 Uses of stearic acid

- Stearic acid is added to products to make them less transparent. When utilized for this purpose, stearic acid can improve the appearance of a lotion, gel or cream to make it more appealing to users.
- Also used as emulsifiers, emollients and lubricants.

4.7 Liquid paraffin

Table No.2: Properties of liquid paraffin

Form	Liquid
Colour	Colourless
Odour	Odourless
Melting point	Undetermined
Boiling point	degrees C>300

4.7.1 Uses of liquid paraffin

- Liquid paraffin is used as a barrier cream by providing a layer of oil on the surface of the skin to prevent water evaporating from the skin surface.
- It is an emollient, sometimes known as skin lubricant.
- It is used to soothe, smooth and hydrate the skin.
- In general this drug is used to soften, hydrate and protect the skin and soothe any irritation, especially in patients with dry skin conditions.
- Benefits of being on this drug can include restoring the skin's smoothness; softness and flexibility by helping the skin retain its moisture.
- **Liquid paraffin**, also known as ***paraffinumliquidum***, is a very highly refined mineral oil used in cosmetics and for medical purposes.

4.8 Bees wax

Structure:

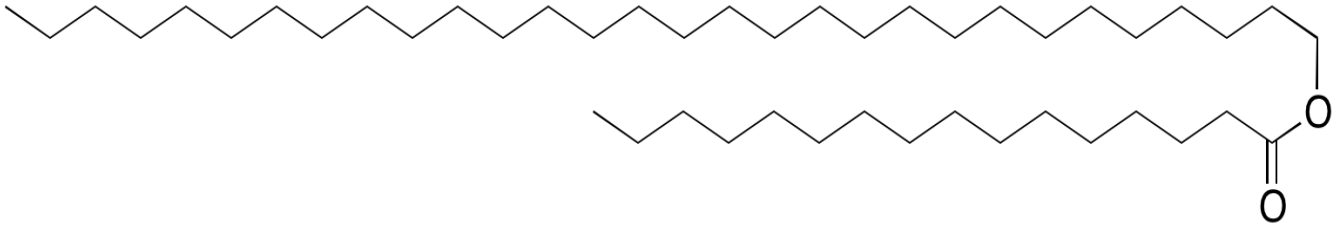


Figure 9: Structure of Triacontanylpalmitate, a wax ester, is a major component of beeswax.

Table No.3: Properties of bees wax

Form	Solid
Colour	Yellow to dark brown
Odour	Characteristic
Melting point	62-64°C
Solubility	Insoluble in water

4.8.1 Uses of bees wax

- Beeswax carries antiviral, anti-inflammatory, and antibacterial properties that are essential in fighting chapped skin and bacterial infections that tend to affect us most in the dry, winter months. It forms a protective wall by sealing in moisture in our skin without smothering and clogging up the pores.
- Because of its anti-inflammatory properties, beeswax has been found to help encourage the healing of wounds. Studies have even found that it is effective against hemorrhoids. It is also being used in hospitals to heal wounds and sores caused by chemotherapy.

4.9Stearyl alcohol

Structure:

Figure 10: Structure of stearyl alcohol

Table No.4: Properties of stearyl alcohol

Form	Waxy flakes
Colour	Unctuous white flakes
Odour	Faint
Melting point	59.5°c
Boiling point	366°c

4.9.1 Uses of stearyl alcohol

- Stearyl Alcohol is used in surface-active agents, lubricants, emulsions, resins, and USP ointments and as a substitute for cetyl alcohol and antifoaming agents.

4.10 Tween-80

Structure:

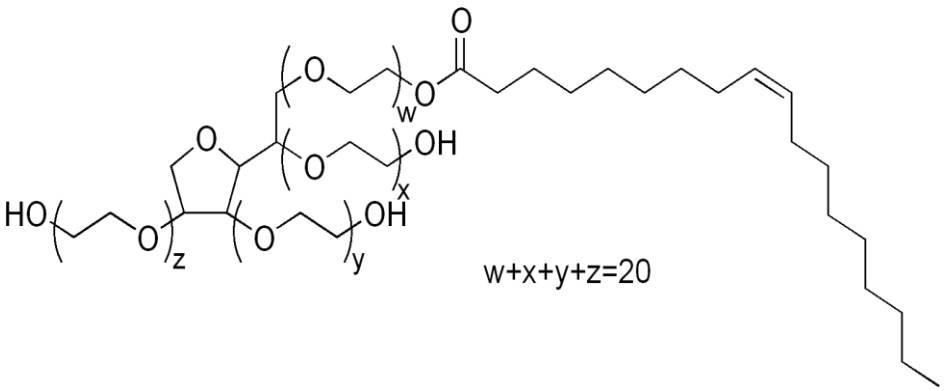


Figure 11: Structure of Tween-80

Table No.5: Properties of Tween 80

Form	Liquid
Colour	Amber
Odour	Characteristic
Boiling point	100°C
Flash point	148°C

4.10.1 Uses of Tween-80

- Primarily used in cosmetics and beauty products as a surfactant and emulsifier because of its ability to help other ingredients

4.11 Methyl paraben

Structure:

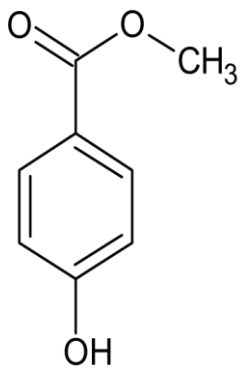


Figure 12: Structure of methyl paraben

Table No.6: Properties of methyl paraben

Form	Crystal
Colour	Colourless
Odour	Odourless
Melting point	125 - 128°C
Boiling point	270 - 280°C

4.11.1 Uses of methyl paraben

- Methyl paraben is an anti-fungal agent often used in a variety of cosmetics and personal-care products.
- It is also used as a food preservative
- Methyl paraben is commonly used as a fungicide in *Drosophila* food media.

4.12 Sorbitol solution

Structure:

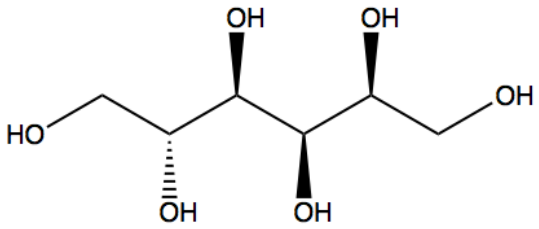


Figure 13: Structure of sorbitol

Table No.7: Properties of sorbitol

Form	DryPowder, Liquid
Colour	White crystalline powder
Odour	Odourless
Melting point	111 °C
Boiling point	295°C

4.12.1 Uses of sorbitol solution

- In skin care products, it acts as a humectant.
- Humectants draw water to the surface of the skin from the environment when there's adequate moisture in the air.

4.13 Potassium hydroxide

Structure:

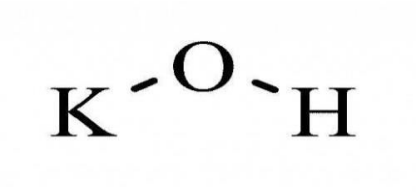


Figure 14: Structure of potassium hydroxide

Table No.8: Properties of potassium hydroxide

Form	Solid pellets
Colour	White or colorless
Odour	Odourless
Melting point	380°C
Boiling point	1324°C

4.13.1 Uses of potassium hydroxide

- Potassium Hydroxide is used in the cosmetic and skin care industry as a pH adjuster or bufferer.
- It has a unique ability to attract water molecules from its environment, and ultimately dissolve into the water that it had originally absorbed, balancing the formula without creating excess weight or changing the composition.

5. MATERIALS AND METHODS

5.1. LIST OF MATERIALS USED

Table No.9: List of materials used

S.No	Materials used*	Sources
1	Leaves of Azadirachta indica	CMS Campus, Kottayam
2	Leaves of Samaderaindica	CMS Campus, Kottayam
3	Rhizome of Curcuma longa	CMS Campus, Kottayam
4	Root of Glycyrrhizagalbraith	CMS Campus, Kottayam
5	Aloe vera plant	CMS Campus, Kottayam
6	Stearic acid	Merck Life Science Private Limited, Mumbai
7	Liquid paraffin	Merck Life Science Private Limited, Mumbai
8	Bees wax	Merck Life Science Private Limited, Mumbai
9	Stearyl alcohol	Merck Life Science Private Limited, Mumbai
10	Methyl paraben	Merck Life Science Private Limited, Mumbai
11	Potassium hydroxide	Merck Life Science Private Limited, Mumbai
12	Tween 80	Merck Life Science Private Limited, Mumbai
13	Sorbitol solution	Merck Life Science Private Limited, Mumbai

*All chemicals and solvents used were of analytical grade

5.2Extraction of the selected plants.

Figure 15: Soxhlet extractor

Soxhlet extraction or hot continuous extraction:

In this method, finely ground sample was placed in a porous bag or “thimble” made from a strong filter paper or cellulose. Extraction solvent i.e. methanolwas heated in the bottom flask, vaporizes into the sample thimble, condenses in the condenser and drip back. When the liquid content reaches the siphon arm, the liquid contents emptied into the bottom flask again and the process wascontinued. The final methanolic extract is collected.

5.3Preliminaryphyto-chemical investigation of methanolicextract of the plants.

Preliminary phyto chemical investigation of the methanolic extract of the plants is done by using HPTLC chromatogram.

5.4 Formulation andevaluation of the herbal skin cream.

5.4.1 Formulation of the herbal skin care cream using the extracts

The formulation trails were done as per formula given in table No.10.The formulation containing Azadirachtaindica, Samaderaindica , Curcuma longa, Glycyrrhizagalbraith and Aloe vera extract was formulated by the method of Nazir et al. The aqueous and oil phases were taken into beakers and heated to 75ºC over a water bath. The oil phase was comprised of extracts of Azadirachtaindica, Samaderaindica , Curcuma longa, Glycyrrhizagalbraith and Aloe vera , liquid paraffin, bees wax, stearyl alcohol, Tween-80 and stearic acid while the aqueous phase was composed of methyl parabens, sorbitol solution and potassium hydroxide. Drop wise addition of the aqueous phase to the oil phase was done with constant stirring at 2000 rpm in a homogenizer for a period of 15 min. The homogenizer speed was then reduced to 1000 rpm and homogenization was continued for another 5 min. The speed was further reduced to 500 rpm and the homogenization extended for 5 min. Herbal skin cream containing Azadirachtaindica, Samaderaindica , Curcuma longa, Glycyrrhizagalbraith and Aloe vera extract was formulated.

Table No.10: Formula for preparation of cream

S.No	Ingredient	Formula1 (%)	Formula2 (%)	Formula3 (%)	Formula4 (%)	Formula5 (%)	Formula6 (%)
1	A. indica Ext.	5.0	5.0	5.0	5.0	5.0	5.0
2	S. indica Ext.	5.0	5.0	5.0	5.0	5.0	5.0
3	C. longa Ext.	5.0	5.0	5.0	5.0	5.0	5.0
4	G. galbraith Ext	5.0	5.0	5.0	5.0	5.0	5.0
5	Aloe vera Ext	5.0	4.0	3.0	3.0	3.0	4.0
6	Liquid Paraffin	5.0	5.0	5.0	5.0	5.0	5.0
7	Stearic Acid	3.0	3.0	5.0	5.0	4.0	5.0
8	Bees Wax	5.0	6.0	5.0	4.0	6.0	5.0
9	Stearyl Alcohol	10.0	10.0	10.0	8.0	8.0	7.0
10	Tween-80	8.0	5.0	5.0	5.0	5.0	6.0
11	Methyl Paraben	0.12	0.12	0.12	0.12	0.12	0.12
12	Sorbitol Solution	6.0	6.0	5.0	5.0	5.0	5.0
13	Pot. Hydroxide	5.0	5.0	5.0	5.0	5.0	5.0
14	De-ionized Water	33.0	36.0	37.0	40.0	39.0	38.0

5.4.2 Evaluation of skin care cream

a) Physical evaluation of the formulation

The formulations were inspected visually for their appearance ,colour and odour.

b) Measurement of pH

The pH was measured using a pH meter, which was calibrated before each use with standard buffer solutions at pH 4, 7, 9. The electrode was inserted into the sample 10 minutes prior to taking the reading at room temperature.

c) Viscosity

The viscosity of the formulations was checked using a Brookfield Viscometer (DV-I PRIME, USA). The gels were rotated at 0.3, 0.6, 1.5 rotations per minute. The viscosity of the gel was obtained by multiplying the corresponding dial reading with the factor given in the Brookfield Viscometer catalogue.

d) Spreadability

Spreadability is measured in terms of time in seconds taken by two slides to slip off from the gel when placed in between the slides under the direction of a certain load. The excess amount of sample was placed between the two glass slides and a definite amount of weight was placed on these glass slides to compress the glass slides of uniform thickness. A weight of 70 g was added and the time required to separate the two slides was noted. Spreabability was calculated using the formula

$S = M.L / T$

where,

M = wt tied to upper slide,

L = length of glass slides,

T = time taken to separate the slides.

e) Stability

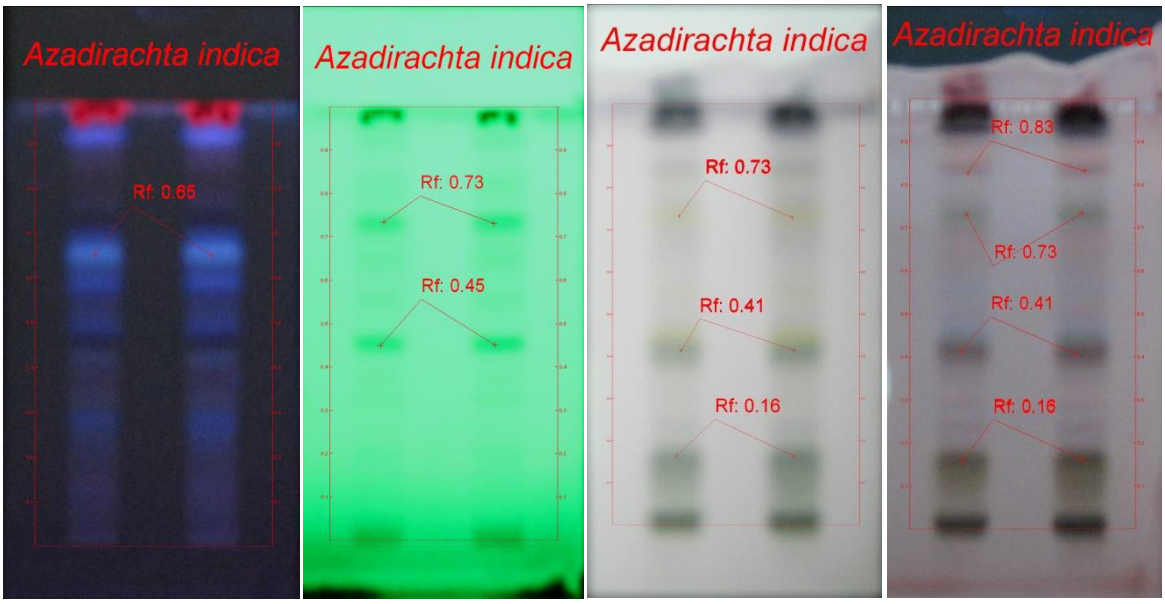
Stability testing of drug products begins as a part of drug discovery and ends with the demise of the compound or commercial product. To assess the drug and formulation stability, stability studies were done according to ICH guidelines. The stability studies were carried out as per ICH guidelines. The cream filled in bottle and kept in humidity chamber maintained at 40 ± 2°C / 75 ± 5 % RH for three months. At the end of studies, samples were analyzed for the physical properties,pH and viscosity.

6. RESULTS AND DISCUSSIONS

6.1 Preliminary phyto chemical investigation of methanolic extract of plants

6.1.1 HPTLC chromatogram of Azadirachtaindica

Mobile phase: Ethyl acetate: n-Butanol: Formic acid: Water (25:15:5:5)
Tank saturation : 20 minutes
Sample applied : 7µl & 9 µl
Solvent front : 85mm
Drying : 5minutes
Detection/visualization: At 366nm, 254nm& after derivatization
Derivatization: Anisaldehydesulphuric acid

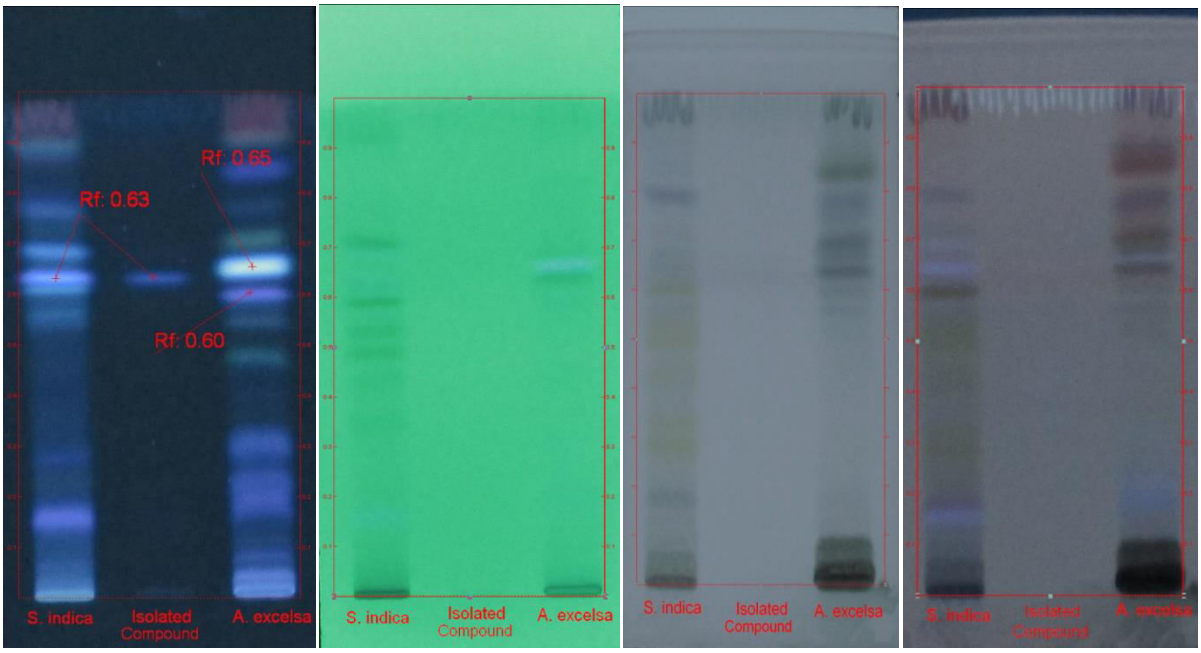


UV 366 nm UV 254 nm Under visible light Under UV 366 nm
Afterderivatizationafter derivatization

Figure 16: HPTLC Chromatogram of Azadirachtaindica

6.1.2 HPTLC chromatogram of Samaderaindica

Mobile phase : Chloroform: Toluene: Methanol (4:4:2)
Tank saturation : 25 minutes
Solvent front : 85mm
Drying : 5minutes
Detection/visualization: At UV 366nm, UV 254nm, after derivertization
Derivertization : Anisaldehydesulphuric acid



UV 366 nm UV 254 nm Under visible light Under UV 366 nm Afterderivatizationafter derivatization

Figure 17: HPTLC Chromatogram of Samaderaindica

6.1.3 HPTLC chromatogram of Glycyrrhizaglabra

Mobile phase : Butyl alcohol: Water: Acetic acid (7:2:1)
Tank saturation : 20 minutes
Solvent front : 85mm
Drying : 5minutes
Detection/visualization: At UV 366nm, UV 254nm, after derivatization
Derivatization : Anisaldehydesulphuric acid

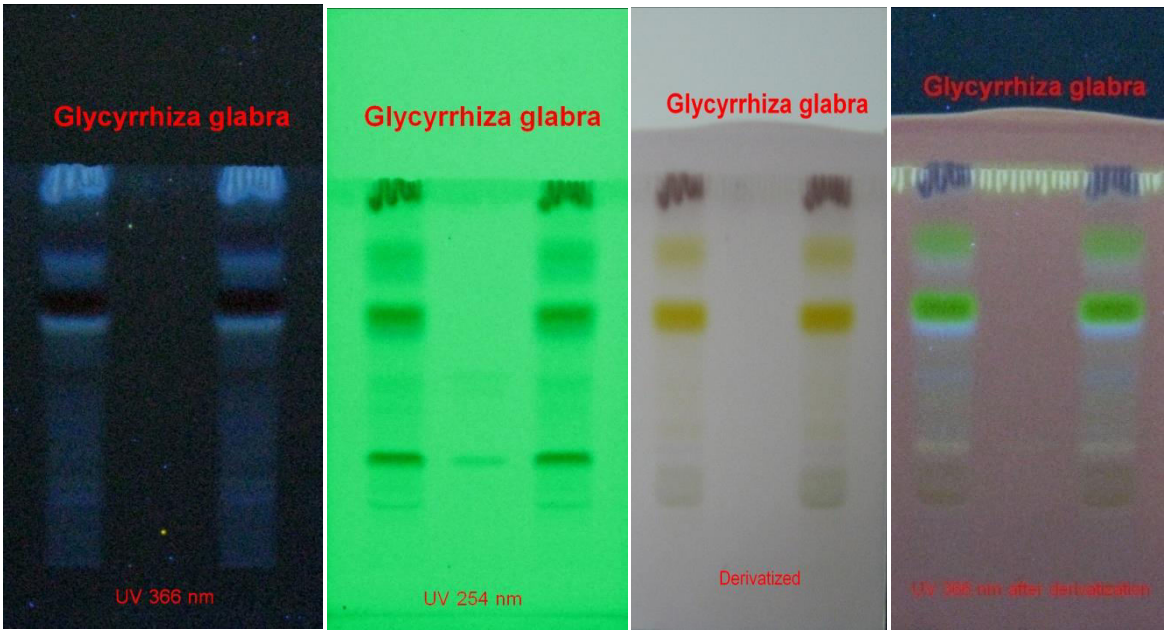


Figure 18: HPTLC chromatogram of Glycyrrhizaglabra

6.1.4 HPTLC Chromatogram of Curcuma longa

Mobile phase : Chloroform: Benzene: Methanol (8: 1.5: 0.5)
Tank saturation : 20 minutes
Sample applied : 7µl for each spot
Solvent front : 85 mm
Drying : 5minutes
Detection/visualization: At UV 254nm & UV 366nm

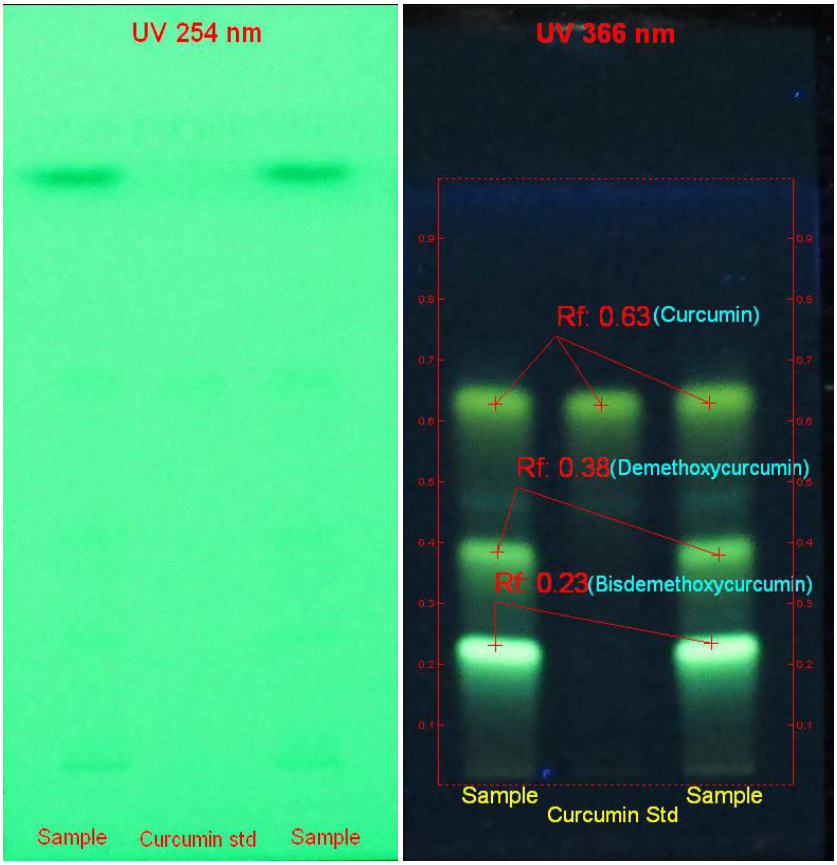


Figure 19: HPTLC Chromatogram of Curcuma longa

6.1.5 HPTLC chromatogram of Aloevera

Mobile phase : Toluene: Methanol: Diethyl amine (8:1:1)
Tank saturation : 20 minutes
Solvent front : 85mm
Drying : 5minutes
Detection/visualization: At UV 366nm, UV 254nm, after derivatization
Derivatization : Anisaldehydesulphuric acid

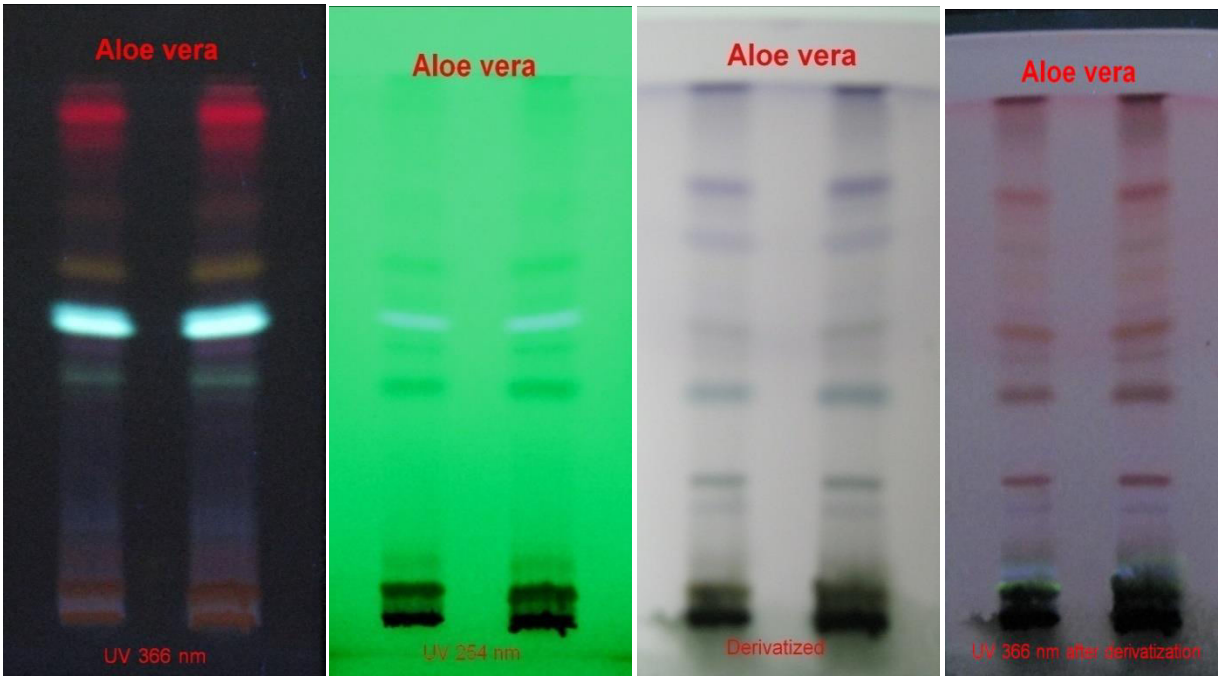


Figure 20: HPTLC chromatogram of Aloe vera

6.2 Evaluation of skin care cream

6.2.1Physical Properties of Cream

Table no.11: Physical Properties of Cream

S.No	Properties	Formula 1	Formula 2	Formula 3	Formula 4	Formula 5	Formula 6
1	Appearance	Semi-solid	Semi-solid	Semi-solid	Semi-solid	Semi-solid	Semi-solid
2	Odour	Characteristic	Characteristic	Characteristic	Characteristic	Characteristic	Characteristic
3	Colour	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown

6.2.2Thermal stability of cream

(Atroom temperature and 65% ± 5% RH)

Table no.12: Thermal stability of cream

Formula 1	Formula 2	Formula 3	Formula 4	Formula 5	Formula 6
Stable, no separation	Stable, no separation	Stable, no separation	Stable, no separation	Slight oily separation	Slightly oil separation

6.2.3 pH of the cream

Table no. 13: pH of the cream

Formula 1	Formula 2	Formula 3	Formula 4	Formula 5	Formula 6
6.05	5.89	6.11	6.02	5.97	5.94

6.2.4 Viscosity of the cream

Table no.14: Viscosity of the cream

rpm	Formula 1	Formula 2	Formula 3	Formula 4	Formula 5	Formula 6
0.3	7342	7413	7534	7241	7187	7216
0.6	3876	3906	3987	3456	3187	3296
1.5	1876	1893	1956	1785	1863	1816

6.2.5 Spreadability of the cream

Table no.15: Spreadability of the cream

	Formula 1	Formula 2	Formula 3	Formula 4	Formula 5	Formula 6
Spreadability (g cm/sec)	14.2	14.1	14.4	13.8	13.7	14.0

6.2.6 Accelerated Stability Studies of Cream

a) Physical Properties of the cream (Initial)

Table no.16: Physical Properties of the cream (Initial)

S.No	Properties	Formula 1	Formula 2	Formula 3	Formula 4	Formula 5	Formula 6
1	Appearance	Semi-solid	Semi-solid	Semi-solid	Semi-solid	Semi-solid	Semi-solid
2	Odour	Characteristic	Characteristic	Characteristic	Characteristic	Characteristic	Characteristic
3	Colour	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown

b)Physical Properties of the cream (After 3 months)

Table no.17: Physical Properties of the cream (After 3 months)

S.No	Properties	Formula 1	Formula 2	Formula 3	Formula 4	Formula 5	Formula 6
1	Appearance	Semi-solid	Semi-solid	Semi-solid	Semi-solid	Semi-solid	Semi-solid
2	Odour	Characteristic	Characteristic	Characteristic	Characteristic	Characteristic	Characteristic
3	Colour	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown

c) pH of the cream(Initial and after 3 months)

Table no.18: pH of the cream(Initial and after 3 months)

pH	Formula 1	Formula 2	Formula 3	Formula 4	Formula 5	Formula 6
Initial	6.05	5.89	6.11	6.02	5.97	5.94
After 3 months	6.02	5.91	6.11	5.98	5.97	5.91

d) Viscosity of the cream (Initial)

Table no.19: Viscosity of the cream (Initial)

rpm	Formula 1	Formula 2	Formula 3	Formula 4	Formula 5	Formula 6
1.5	1876	1893	1956	1785	1863	1816

e)Viscosity of the cream (after 3 months)

Table no.20: Viscosity of the cream (after 3 months)

rpm	Formula 1	Formula 2	Formula 3	Formula 4	Formula 5	Formula 6
1.5	1789	1810	1914	1721	1803	1765

Accelerated stability testing of prepared formulations were conducted at 40° ± 2°C temperature and 75± 5% relative humidity and studied for 90 days.

7. SUMMARY

The objective of the present work was to formulate and evaluate a skin cream for wound healing. Although various types of cream is considered for wound healing but these are still appears to be limited in rate of tissue regeneration**.** Plants are more potent healers because they promote the repair mechanism in the natural way.In this modern era, the knowledge and experience of usage of herbs are being blend with advanced cosmetic technology to develop a safe and effective product**.**

In the present study, skin cream was prepared using herbal plants such as Azadiractaindica ,Samaderaindica, Curcuma longa , Glycyrrhizagalbraith and Aloe vera .Initially, the research work started with a wide and thorough literature survey .Various formulations were prepared by varying the amount of excipients such as stearic acid, bees wax, stearyl alcohol, tween-80, methyl paraben , sorbitol solution , potassium hydroxide ,deionised water ect. Formulation of Herbal Skin Cream for wound healing was successfully developed that met the relevant pharmaceutical characteristics. The prepared formulations are then evaluated for parameters like physical properties, pH , viscosity, spreadability and stability of the formulated cream. The prepared formulations showed good spreadability, no evidence of phase separation and good consistency during the study period. Stability parameters like visual appearance, nature, viscosity and pH of the formulations showed that there was no significant variation during the study period. The prepared formulations showed proper pH range that is approximately pH 6; it confirms the compatibility of the formulations with skin secretions. The creams were found to be stable during stability study according to ICH guidelines (40 ± 2 °C/ 75 ± 5 % RH) for 3 months. From the present study it can be concluded that it is possible to develop creams containing herbal extracts and can be used as a barrier to protect skin.

8. CONCLUSION

Formulation of Herbal Skin Cream for wound healing was successfully developed that met the relevant pharmaceutical characteristics. The prepared formulations showed good spreadability, no evidence of phase separation and good consistency during the study period. Stability parameters like visual appearance, nature, viscosity and pH of the formulations showed that there was no significant variation during the study period. The prepared formulations showed proper pH range that is approximately pH 6; it confirms the compatibility of the formulations with skin secretions. The creams were found to be stable during stability study according to ICH guidelines (40 ± 2 °C/ 75 ± 5 % RH) for 3 months. From the present study it can be concluded that it is possible to develop creams containing herbal extracts and can be used as the provision of a barrier to protect skin.Plants are more potent healers because they promote the repair mechanism in the natural way. The wound healing property of the formulated herbal skin cream has yet to be experimented and will be done in future.

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