

Formulation and Evaluation of Topical Herbal Ointment from *Euphorbia Royleana* Latex Linn. for Psoriasis

Pathare Jalindar Dattatray, Shinde Hrutuja Subhash, Walunj Jayashri Lahu, Dr. Tarate Bapurav

Matoshri Miratai Aher College of Pharmacy, Karjule Harya, Ahilyanagar, India
jalindarpathare7@gmail.com, shinderutu9876@gmail.com, jayashriwalunj4@gmail.com

Abstract: *Psoriasis is an inflammatory skin disease characterized by scaling and inflammation (pain, swelling, heat and redness) resulting in thick, red skin with silvery scales. These spots may be itchy or painful. Psoriasis is now treated with systemic, local treatment and light therapy. These treatments have some negative and potentially fatal side effects. Patients with psoriasis are more likely to develop other diseases such as psoriatic arthritis, anxiety and depression, cancer, metabolic syndrome, cardiovascular disease and Crohn's disease. Most people use herbal medicine because it is readily available, cheap and effective. Many plants have promising properties, including remarkable results in the treatment of psoriasis. The aim of this study is to identify plants, herbal preparations and related therapies that could add value to the development of a better, safe and effective psoriasis drug which can help new researchers in the field (1).*

Keywords: *Euphorbia Royleana, Psoriasis, Sullu spurg, cytotoxic, euphorbiaceae, succulent*

I. INTRODUCTION

Psoriasis is a common, chronic, non-infectious autoimmune disease. It mainly affects the skin and is seen in about 2-3 percent of the world's population. The word "psora" comes from a Greek word meaning "itch". Used since 133 BC, the term psoriasis was originally grouped under leprosy until the 19th century. It has been suggested that the biblical leprosy was actually the disease now known as psoriasis. It is mostly a hereditary disease caused by scaly, red and itchy patches. The most commonly affected areas are the entire scalp and can also spread to the forehead, neck or behind the ears, chest, arms, elbows, armpits, under the breasts, around the genitals, knees, toenails and fingernails. Men and women alike and it also affects children, adults, the elderly and can occur at any age. According to National Psoriasis, it is more common in people ages 15 to 35. Foundation Psoriasis is caused partly by genetic and partly by environmental factors. Psoriasis can be classified as mild, moderate and severe. Mild psoriasis causes a rash, and when it becomes moderate, the skin peels off. In severe cases, red spots may appear on the surface of the skin and may itch. It affects a person's work and social life. The usual mechanism. The body must make new skin cells every month to replace the shed skin. But with psoriasis, new skin cells grow rapidly in days instead of weeks. This leads to a buildup of dead skin on the surface of the skin, resulting in thick, red, dry, itchy patches of skin. In India, the prevalence of psoriasis varies between 0.44 and 2.8 percent. Most of these patients are mild to moderate in severity and can be treated with topical agents that offer potential therapeutic efficacy and limit the adverse effects of systemic therapy on the target tissue. Psoriasis is a lifelong immune-mediated inflammatory skin disease associated with conditions such as psoriatic arthritis, psychiatric, cardiovascular and liver diseases. In 2014, the World Health Organization recognized psoriasis as a serious non-communicable disease and highlighted the anxiety associated with misdiagnosis, inadequate treatment and stigma. The Global Burden of Disease Study estimated that psoriasis accounted for 5.6 million disability-adjusted life years (DALYs) of all ages in 2016; at least three times higher than in inflammatory bowel disease. (2)

Types of Psoriasis

- 1) Plaque psoriasis
- 2) Guttate psoriasis

- 3) Inverse psoriasis
- 4) Pustular psoriasis
- 5) Erythroderma psoriasis

1) Plaque psoriasis

Plaque psoriasis, or psoriasis vulgaris, is the most common form, which occurs in 75-80% of all psoriasis sufferers. When the lesion is fully developed, it is a well-defined red-purple, round or oval plaque of at least 1 cm in diameter, covered with white, silvery scales, topped by bones. In patients with dark pigmentation, the lesions become hyperpigmented in various shades of brown or black, especially when the patient scratches or rubs them. The most common areas are the elbows, knees, scalp, sacrum, navel, buttocks and genitals, and all these areas should be checked: any of them can be a lonely place.

2) Guttate psoriasis

Psoriasis, named after the tear-shaped lesions, accounts for approximately 18% of all cases, more often in children and young adults. Droplet lesions are 0.1-1.0 cm in diameter and are not as hardened or scaly as plaque psoriasis lesions. They predominate in the trunk and nearby regions of the limbs and probably involve the face.

Guttate psoriasis may be the first manifestation of psoriasis or an acute exacerbation of existing chronic plaque psoriasis. Patients often have upper respiratory infections, laryngitis or tonsillitis. Streptococci and intestinal psoriasis. Some acute cases of guttate stigma are thought to be caused by infection with group A, C, and G streptococci. Leung et AL7 showed that in 10 patients, acute psoriasis after streptococcal throat infection was caused by streptococcal exotoxin C, which acts as a superantigen and activates CD4+ and CD8+ T cells in and around the lesions. The researchers hypothesize that these T cells persist in the skin of patients with chronic plaque psoriasis because the T cells mistakenly recognize skin autoantigens such as keratins and carbohydrates as bacterial antigens.

3) Inverse psoriasis

Also called flexor psoriasis. Inverse psoriasis affects the trigeminal areas and is clinically characterized by slightly erosive erythematous plaques and patches.

4) Pustular psoriasis

Pustular psoriasis is perhaps 1.7% of cases. It is characterized by sterile pustules located on the palms and soles or generalized.

Localized pustular psoriasis. The rash is chronic and recurrent and is identified by yellowish pustules under palmar redness and scaling (thenar and hypothenar eminence) or on the sole and lateral heel (FIGURE 3) or both. Areas Lesions can be seen at all stages of development, including vesicles, blisters, bumps, and dried brown macular papules. There is female supremacy. Generalized (von Zumbusch) pustular psoriasis may develop from de novo or preexisting plaque psoriasis and is characterized by fiery red irregular patches with rounded, convex, serpinous edges, over which tens of thousands of 1 mm x 2 mm superficial pustules may form. Seen (FIGURE 4). They usually occur in areas of curves or skin folds (armpits, groin, under the breasts), but they can appear anywhere. Pustules coalesce into pus pools, slough and form new pustules as the border moves in waves every 24 to 72 hours. Most patients present with fever, leukocytosis, hypocalcemia, and hypoalbuminemia. The frequency of occurrence is equal in men and women.

Ryan and Bakers reported that 37 (24%) of 155 patients developed their first attack of generalized pustular psoriasis within a month of starting or stopping systemic corticosteroids and concluded that the steroids triggered the attack. Other precipitating factors were infection and other medications. Methotrexate was less effective in patients previously receiving systemic corticosteroids.

Ohkawara et al recently reviewed 208 recurrent cases of generalized pustular psoriasis and found that patients with plaque psoriasis were more likely to receive corticosteroids than those without psoriasis. Caused by infection.

5) Erythrodermic psoriasis

Exfoliative rash or psoriatic erythroderma accounts for only 1-2% of all psoriasis, so it is the rarest. Erythroderma is usually defined as an itchy, inflammatory process on the skin that covers all or nearly all of the body surface. Erythrodermic psoriasis usually develops gradually or acutely during chronic plaque psoriasis, but it can be the first manifestation of psoriasis even in children. Sterile pustules may form in some areas of erythrodermic psoriasis. Patients with the most unstable cases (ie, inflammation) may develop generalized pustular psoriasis. Concomitant psoriatic arthropathy is common.

Causes of erythrodermic psoriasis include systemic disease, emotional stress, and alcoholism, but the most important appear to be related to treatment, especially the inappropriate or excessive use of potent topical, oral, and intramuscular corticosteroids.

Patients are at risk of Staphylococcus aureus septicemia Due to their weakened skin defenses and in some cases immunosuppressive Medications.(3).

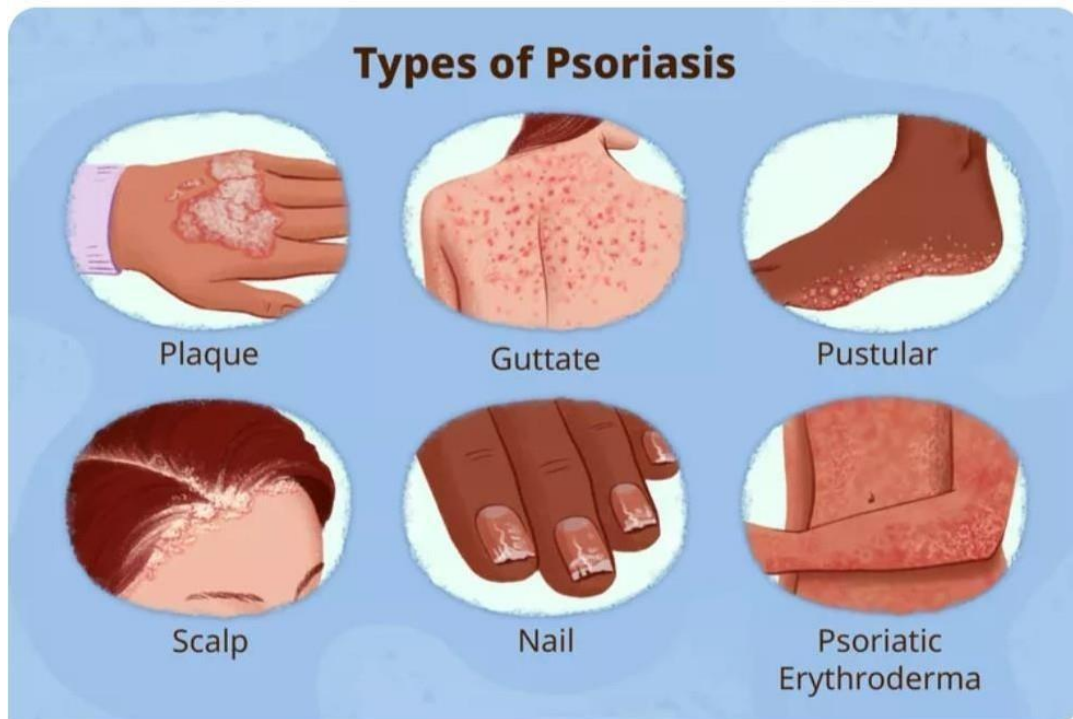


Fig : 1 Types of psoriasis (3)

II. LITERATURE REVIEW

1) Herbal Treatment for Management of Psoriasis: An Overview (March 2022). Ravindra Ganpati Gaikwad, Anil Kumar shinde, Ashok .A. Hajare, The present study Plans to emphasize such plants, herbal formulations, and associated therapy, which could add value to the development of a better, safe, and efficacious formulation to treat psoriasis that may help new researchers in this field.

2) Psoriasis: A Review of Existing Therapies and Recent Advances in treatment (Oct2018). Siddharth dutta, Shalini Chawla, Sahil Kumar, This paper describes an array of target based therapies like biologics which target the Cytokine mediators and their receptors resulting into more specific and better therapeutic Outcome. Immuno-pathogenesis has been described in detail along with all the approved biologics Acting on various steps of pathogenesis cascade and the promising ones in various phases of trials for the treatment of moderate to severe psoriasis. Reid C, Griffiths CEM.

Psoriasis and Treatment: Past, Present and Future Aspects. Acta Derm Venereol. 2020 Jan 30;100(3):adv00032. Doi: 10.2340/00015555-3386. PMID: 31971601; PMCID: PMC9128930.

3) Assessing Disease Activity in Psoriatic Arthritis: A Literature Review, 23 November 2018. It is well recognized that psoriatic disease is a complex condition, encompassing a multitude of clinical manifestations, which significantly impact patients' function and quality of life. In recent years, there has been a paradigm shift towards the development of disease activity indices that are responsive to clinical measures and also patient-reported outcomes, thereby capturing the full burden of disease. Widespread implementation of these instruments in routine clinical practice and research trials will be pivotal to providing clinicians with a better understanding of the full patient experience, in aiding treatment decisions and providing further details on patient satisfaction and efficacy of novel therapies in PsA.

4) Review of natural compounds for potential psoriasis treatment. March 2023. Omali.Y.Elkhawaga, Mohamed M.Ellety, sheref O Mofty, Mohammad.S.Ghanem, Abdallah O Mohommad, Context intends to talk in our review about natural products or plants that may have therapeutic characteristics for this disease and may have few or no side effects on the patient's body.

5) Formulation And Evaluation Of Topical Herbal Ointment From Tridax Procumbens L.And Azadiractha Indica Leaves Extract For Wound

HEALING ACTIVITY. Miss. VidyaShankar Chougule, Miss. Yogita Dhanaji Bidkar, Mr. Sangram RajaramJadhav¹ Miss. Shruti Parsharam Patil, Miss. Prajakta Sanjay Kakade¹. Pallavi Tanawade¹. In Ayurveda Tridax procumbens and Neem were used for their various medicinal properties like Antibacterial, antifungal, anti-inflammatory, wound healing, etc. Thus, these formulations could become a medium to use these medicinal properties effectively and easily as a formulations dosage form like Ointments using locally available plants. Based on antimicrobial efficacy, two different local plants were taken and their ethanolic extracts were incorporated in the most effective ratio inappropriate base. The phytochemical constituents such as alkaloids, flavonoids, glycosides, tannins, carbohydrates, sterols, saponins, proteins, and other miscellaneous phenolic components are believed to play a pivotal role in the healing of the wound by significantly increasing the rate of wound closure and epithelisation. The F-land F- 2 product readily spread on the skin surface, showed no irritant effect, diffused well, and was stable at different evaluation parameters. The ointment was found to have antimicrobial activity against E.Coli It was concluded that the formulations' was found to be better physicochemical characteristics and higher pharmacological activity compared to marketed formulation. The formulation developed from tridax and neem showed significant results so it can be further used commercially to develop wound healing ointment after conducting clinical trials.

6) Formulation C Evaluation of Multipurpose Herbal Cream Bhavana Patil, Neha Yadav, Gopal Yadav, Shrikesh Yadav, Suraj Yadav, Dr. Smita Takarkhede. By using Aloe vera gel, Neem and Turmeric the cream showed multipurpose effect and all herbal ingredients were used showed different significant activities. Based on the results we can say that all three formulations FIH, F2H and F3H were stable at room temperature and can be safely used on the skin.

III. OCCURRENCE

Psoriasis affects both males and female with earlier onset, in female and those with family history. Its age of onset Shows a bimodal distribution with peaks at 30-39 years and 60-69-year men, 10 years earlier in women.(4)

Causes

- Imbalance of bacteria is due to following reasons:
- Due to use of antibiotics
- Hormone imbalance
- Poor eating habit
- Genetics

- The immune system.(5)

Symptoms

- Skin abnormalities comprise a deep red along with peeling or splitting skin.
- Itching
- Scaly skin
- Irritation and redness
- Swelling
- Blister . (5)

Pathogenesis

Psoriasis is a hyperproliferative skin disease in which epidermal turnover is increased. The pathogenesis of psoriasis involves the interaction of cellular mechanisms and interaction between T cells, antigen-presenting cells (APC), keratinocytes, Langerhans cells, macrophages, natural killer cells, several Th1-type cytokines, and certain growth factors such as Angi- Endothelium growth factor (VEGF), keratinocyte growth factor (KGF), etc. is said to play a key role in the Pathogenesis of psoriasis. It is an immunologically mediated disease, activation of T-lymphocytes causes inflammation of the skin. Component and second, epidermal hyperproliferation is also associated with inflammatory events. It is assumed that different mechanisms are involved in the pathogenesis of psoriasis:

- T cell function.
- The role of the dendritic cell
- Hyperproliferation of keratinocyte disease
- Angiogenesis Cytokine mediators:
- Reduced apoptosis
- Genetic factors
- Role of oxidants and antioxidants in psoriasis

T cell function:

The primary function of T cells is to recognize processed peptide antigens associated with proteins encoded by MHC class II genes. Therefore, for activation, T cells require APCs to process and present peptide fragments on the cell surface of the APC. T cells secrete various lymphokines. T cells can also suppress immune responses; in this role they are called suppressor T cells. Different T cell populations express different cell membrane proteins. The majority of helper T cells are CD4-positive, while cytolytic suppressor cells are CD8- positive. Activation of T cells requires three

Steps :

Bonding

Antigen-specific activation (signal 1)

Non-antigen-specific cell-cell interaction (signal 2)

The role of dendritic cells:

Dendritic cells are the main class of antigen-presenting cells that are increased in psoriatic skin. Langerhans cells are a type of immature dendritic cell (IDC) found in normal epidermis and can also be found in psoriatic lesions. These IDCs are stimulated to further develop into mature DCS (mDCs). Psoriasis lesions show a significant increase in DCs in the skin. Myeloid DCs expressing XIIIa and CD11c or CD83 and DC-LAMP proteins are positive for MDC.

Hyperproliferation of keratinocytes:

The skin provides a protective mechanism with its multi-layered structure. The epidermis consists of five layers: stratum Basale, spinosum, granulosum, lucidium and stratum corneum. Keratinocytes are mostly formed basally and migrate further into the stratum corneum. As the cells. Move to the surface, their organelles disappear and become filled with keratin. The top layer of keratin Provides a protective property. Under normal conditions, the epidermal cell cycle is completed in about Four weeks. However, in psoriatic skin, the epidermal cell cycle accelerates. Cell division

in the basal Layer occurs every 1.5 days, and keratinocytes migrate to the stratum corneum every 4 days. This causes. Hyperproliferation of keratinocytes.

Angiogenesis

Keratinocytes produce pro-angiogenic cytokines (VEGE, but the exact mechanism of Angiogenesis in psoriasis is still not known. In psoriasis, endothelial cells swell and become activated. These activated endothelial cells migrate, sprout and form structural support with basement membrane pericytes to form). New blood vessels. 115) This leads to an expansion of intercellular spaces. And thus, the blood vessels of the skin become larger, which facilitates the transfer of leukocytes to the skin.

Cytokine mediators

In psoriasis, the production of cytokines leads to hyperproliferation of the epidermis, dilation of blood vessels and inflammation of the skin. Cytokines involved in the development of psoriasis include granulocyte-macrophage colony-stimulating factor (GM-CSF), epithelial growth factor (EGF), 11-8, 11- 12, IL-1, IL-6, IFN- γ , and TNF- α . These cytokines lead to keratinocyte proliferation, neutrophil migration, enhancement of Th-type responses, angiogenesis, upregulation of adhesion molecules, and epidermal hyperplasia.

Decreased apoptosis

To maintain a constant thickness of the epidermis, keratinocyte, regulated by apoptotic cell death in the normal epidermis. The epidermal characteristic of psoriasis is thought to result from overexpression of P53, and these proliferative cells normally express Bel-2, which protects them against apoptotic stimuli, while terminally differentiated cells lose Bcl-2 expression.(6)

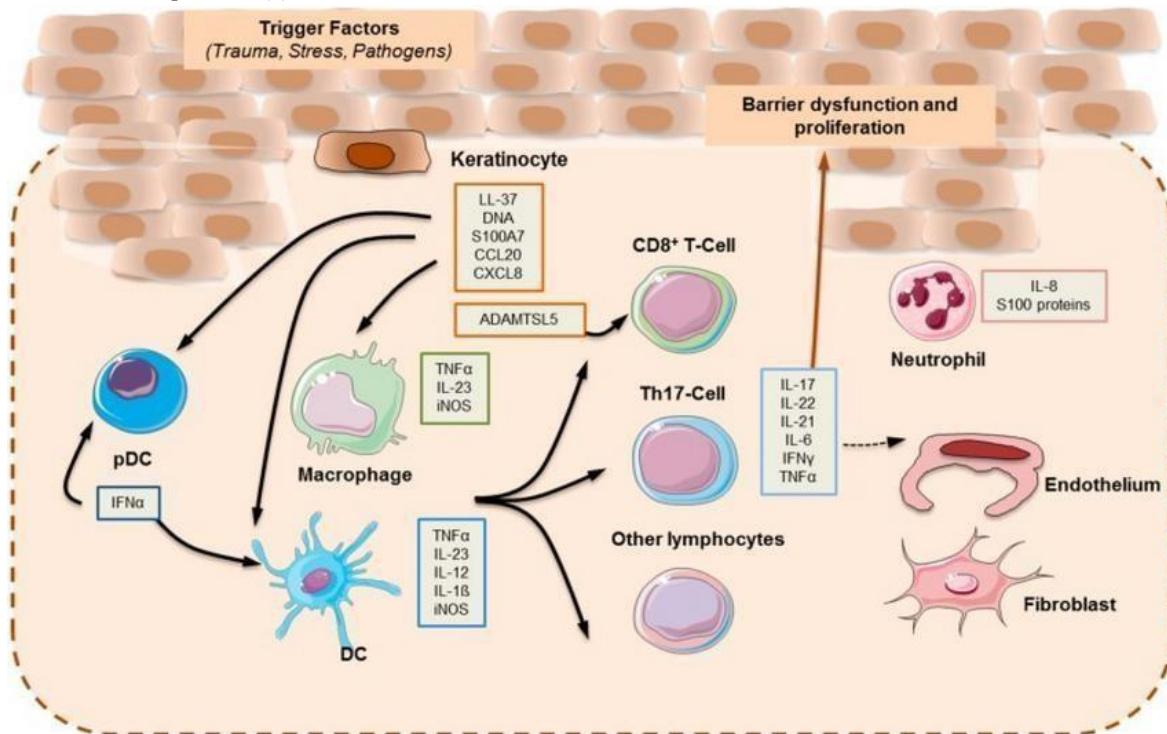


Fig : 2 Pathogenesis of psoriasis(6)

III. MATERIALS AND METHODS

Collection of plant material

Euphorbia Royleana , Aloe vera

Excipients and herbal ingredients with their roles :

Sr. No	Ingredients	Roles
1.	Euphorbia royleana	Anti- Psoriatic activity, wound healing
2.	Mustard oil	Maintain elasticity by formation of collagen
3.	Aloe vera gel	Anti- ageing , anti- inflammatory, moisturizer , reduce acne and pimples (7)
4.	Wool fat	Emollients , skin foods, salves, superfatted soaps, and fur dressing
5.	Cholesterol alcohol	Emulsifier, surfactant, foam booster, viscosity increasing agent
6.	Stearic acid	Emulsifier, emollients, lubricant
7.	White soft paraffin	Moisturizers the skin.(8)

Materials and methods

Collection of plants material

Euphorbia Royleana , Aloe vera

Euphorbia Royleana



Fig : 5 Euphorbia Royleana

Euphorbia royleana or Sullu Spurge is an erect, deciduous, flowering shrub or tree with rounded, fleshy, segmented branches and a stiff hairy trunk. It is set with short spines on the stem. It has a cactus-like appearance, although it is not related to a cactus. The leaves are clustered and large and appear in the rainy season and early autumn. Spikes are north facing pairs with a wide flat surface. The plant is slightly poisonous and the juice can irritate the skin. The plant is easy to grow, prefers well-drained soil and full sun. Unlike most succulents, Sullu Spurge does not tolerate long periods of drought. Native to Pakistan. It is often found on dry and rocky slopes at high altitudes. It is used as a living hedge for cattle control in North India.(9)

Synonyms– Sullu spurg and Royle’s spurge. Biological source – Euphorbia royleana is a species of flowering plant in the family- Euphorbiaceae. It is also known as Sullu’s spurge and Royle’s spurge. It is succulent and almost cactus-like in appearance, although not related.(10)

Chemical components – (1), 13-carboxylmenol-C9-0-B-glucoside (2), 3, 3’ - Dimethylellagic acid 4-O-B-D-glucopyranoside (3), cycloart-23-ene-33,25-diol (4), 23E-25-methoxycycloart-23-en-3-ol (5), α -amyrin (6), tryptohypol F (7), 9 (11), 12-dieniolean-3-ol (8), friedolane-3B, 29-diol (9), DA-friedolane-29-ol-3-one (10), dishidiol (11) kageleol (12).(11)

Uses - Used by E. royleana is a member of the Euphorbeaceae family, a unique plant historically used to treat skin problems, asthma, jaundice, anemia, coughs and constipation. Euphorbias are scientifically known to be antiviral, antimicrobial, anticancer, cytotoxic and antitumor (12)..

Euphorbia Royleana oil

Take 1000 ml of Euphorbia Royleana latex and add 250 ml of Mustard oil.

Boil until all the water content of this solution has evaporation



Aloe vera

Synonym – Aloe Musabbar, kumari

Biosource – Aloe is the dried juice of the leaves of Aloe barbadensis Miller known as Curacao aloe; or whatever Aloe perryi Baker, known as Socotrine aloes; or Aloe ferox Miller and its hybrids Aloe africana Miller and Aloe spicata Baker, known as Cape aloes, belonging to the Family -Liliaceae

Chemical constituents – All aloe cultivars are important sources of anthraquinone glycosides. The p- component of aloe is aloin, which is a mixture of glycosides that includes barbaloin. It is chemically the anthrone C-10 glycoside of aloemodin and is the most important water-soluble. Barbaloin is a C-glycoside and is not hydrolyzed by heating with dilute acids or alkaline chloride, oxidative hydrolysis of barbaloin to emodin and glucose. Aloe-emodin-anthrone, add In to barbaloin, aloe also contains isobarbaloin, B-barbaloin, aloemodin. The drug also contains aloetic acid, homonataloin, aloesone, chrysophanic acid, chrysoic acid, galactoronic acid, choline, choline Salicylate, saponins,

mucopolyglycolate alcohol, hexacarinat alcohol., etc. The number of different commercial beards varies greatly. Aloe vera contains about 22 percent barbaloin. Indians usually vary with Aloe vera, but this is a much smaller amount (3.5-4 centimeters). Curaçao aloes contain two and a half times more aloe emodin compared to Cape-aloe- emodin. Aloe resin contains aloesin. It is a type of C- glycosylchrome. Aloesin is also responsible for the cleansing effect of aloe.

Uses

- Aloe is used as a purgative.
- In high doses acts as abortifacient.
- Anti-spasmodoil. (13)



Fig : 4 Aloe vera

How to collect.

Collect mature and fresh aloe vera leaves from the plant. Washed with distilled water. Dried in a hot air oven. The leaf is cut lengthwise with a rille knife. The semi-solid aloe vera is then collected. Remove the fibers and impurities it, Aloe Vera extract is obtained. (14)

Formulation Table

Sr.No	Name of Ingredients	Quantity
1	Euphorbia Royleana oil (Euphorbia Royleana Latex + mustard oil) (4:1)	2.5ml
2	Aloe vera gel	0.5 gm
3	Wool fat	1.5 gm
4	Cetostearyl alcohol	2 gm
5	Stearic acid	2 gm
6	White soft paraffin	1.5 gm

Procedure :-

Firstly, the ointment base was prepared using Wool fat, white soft paraffin, cetostearyl alcohol and stearic acid by precise weighing and placed in a water bath evaporating dish.

After melting, the mixture is mixed and then the ointment is cooled.

The herbal ointment was prepared by mixing accurately weighed Euphorbia Royleana oil and Aloe vera gel with the ointment base to obtain a uniform paste of 2 or 3 times its weight.

Base, gradually adding more base.

Until a homogeneous cream is formed, finally transfer to a suitable container. (15)



Fig : final formulated herbal ointment

Evaluation test

Sr.No.	Test	Observation
1.	Colour	Pale yellow
2.	Odour	Characteristics
3.	Consistency	Smooth
4.	pH	6.7
5.	Microbial growth	No
6.	Solubility	Soluble in fixed oil and Insoluble in water
7.	Washability	Good
8.	Non irritancy	Non- irritant
9.	Stability study (25°C and 36°C)	Stable

IV. RESULT AND DISCUSSION

This study was the formulation and evaluation of herbal ointment. The results included evaluation parameters such as physical evaluation of the Ointment. Lubricating, non-irritating, so there is no vacuum and phase separation herbal psoriasis action Ointment. (16)

WHY This formulation more effective than other's ???

Ointments tends to be more soothing and less irritating than creams. This may help anyone who has psoriasis because psoriasis makes the skin dry and scaly. They tend to be thicker, more occlusive, and therefore more effective.

The treatment works by reducing inflammation. This slows the production of skin cells reducing itching. And Ointment provide more lubrication and occlusion than other preparations, and are the most useful for treating dry or thick hyperkeratotic lesions. The Ingredient which are used in this formulation is euphorbia royleana has astringent, anti-inflammatory and anti-bacterial properties, is effective in treating various skin disorders. It is also a potent antidandruff agent Which is beneficial in treating scalp disorders.

Mustard oil contain octanoic acid which has antifungal properties, is one of the major active constituents of mustard. It also contains vitamins E and K and minerals such as iron -Inherent antifungal C anti-bacterial properties. The lauric acid content in mustard oil has a beneficial effect on collagen production. -collagen helps skin maintain firmness and elasticity.

V. CONCLUSION

Ointment composition according to evaluated parameters such as color, odor, composition, pH, microbial growth, solubility, detergency, non-irritation, stability. The study of the ointment shows a good anti-psoriasis result.

REFERENCES

- [1]. <https://www.researchgate.net/publication/362529565> Herbal Treatment for Management of Psoriasis An Overview.
- [2]. <https://pubmed.ncbi.nlm.nih.gov/31971601/>
- [3]. <https://www.ccjm.org/content/ccjom/67/2/105.full.pdf>
- [4]. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8140694/>
- [5]. <https://images.app.goo.gl/ustDPW5jWtigpd158>
- [6]. <https://link.springer.com/article/10.1007/s10787-023-01178-0#Fig1>
- [7]. <https://www.researchgate.net/publication/328138246> Psoriasis A Review of Existing therapies and Recent Advances in Treatment.
- [8]. <https://pdxscholar.library.pdx.edu/cgi/viewcontent.cgi?article=3693&context=0>
- [9]. <https://www.jetir.org/papers/JETIR2208515.pdf>
- [10]. <https://plants.ces.ncsu.edu/plants/euphorbia-royleana/>
- [11]. <https://ajpsonline.com/AbstractView.aspx?PID-2019-9-1-5>.
- [12]. <https://pesquisa.bvsalud.org/portal/resource/pt/wpr-855195>. <https://www.jetir.org/papers/JETIR2208515.pdf>.
- [13]. A book of pharmacognosy by C.K Kokate, A. P. Purohit and S. B. Gokhale Nirali prakashan. 56th edition, Page no-9.9-9.15
- [14]. <https://www.jetir.org/papers/JETIR2203439.pdf>.
- [15]. <https://www.jetir.org/papers/JETIR2208515.pdf>
- [16]. <https://www.researchgate.net/publication/358662530> Formulation and Evaluation of Herbal Face Cream.