



Formulation And Development Of Herbal Sunscreen Cream.

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ABSTRACT :-

Sunscreen is a chemical compound that help protect you from UV rays sunburn is caused by ultraviolet B radiation but ultraviolet a may be more damaging to the skin. Sunscreen should ideally block both wavebands.

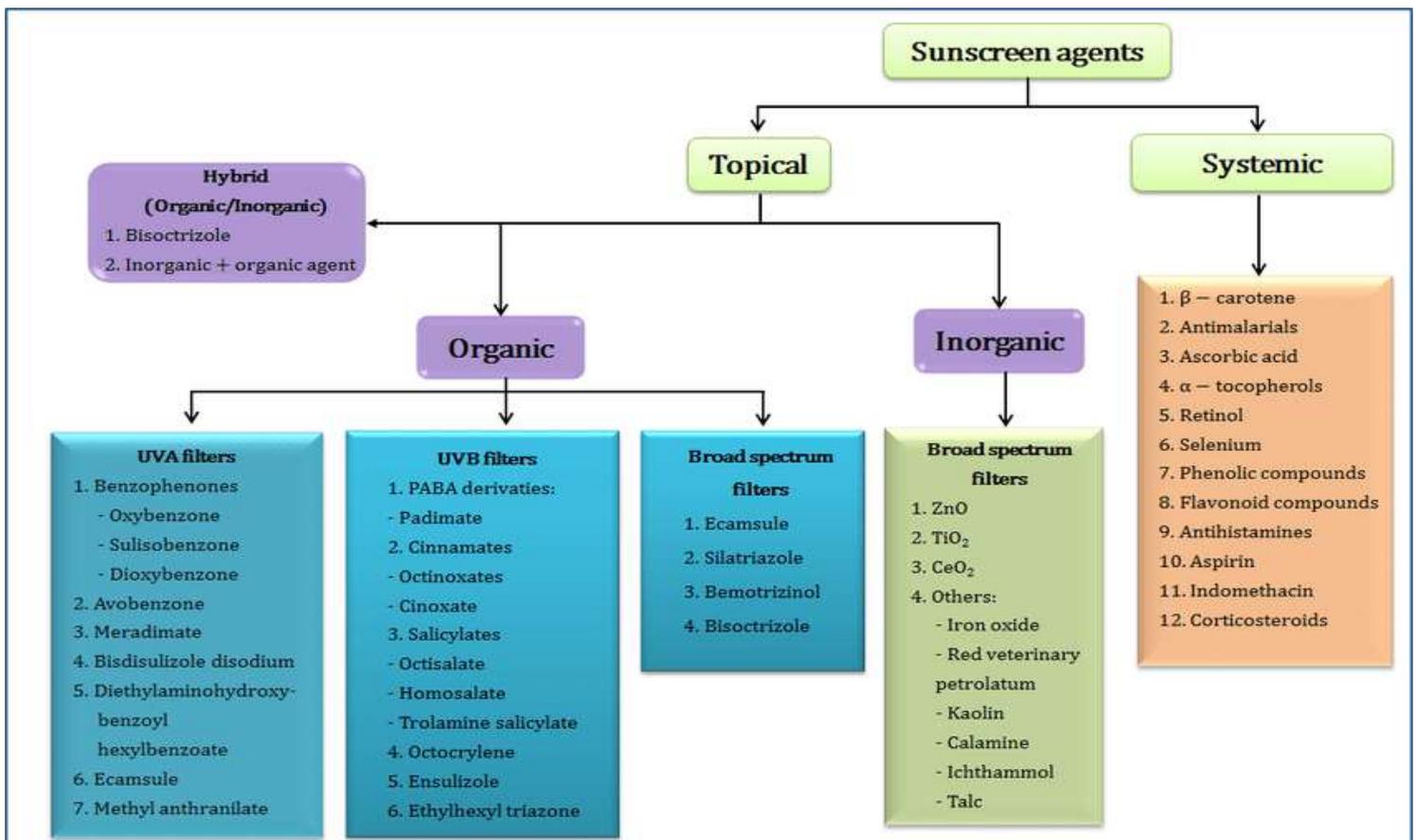
Sunscreen should ideally block both wavebands. The aim of this study was to develop a topical sunscreen formulation based on some fixed oils, in combination with some medical plants. Regular use of sunscreen reduces the development of actinic keratosis, squamous cell carcinoma and melanoma. Sunscreen may be organic or inorganic chemicals. Sunscreen is also known as sunblock lotion.

The sunlight includes dangerous radiations which influence the skin health. Herbal sunscreens resource the body's protection mechanisms to shield against harmful UV radiation from the sun. In the present study, sunscreen creams were formulated with Turmeric extract and Aloe vera extract. Physico-chemical evaluations and in-vitro evaluation was done and of Sun Protection Factor (SPF) were also performed for the formulations. The SPF calculation of prepared cream was done using Mansur equation and was compared with a marketed herbal product. The formulated cream was having good physicochemical characteristics. The SPF evaluation results (SPF-24.888) indicated that the prepared herbal sunscreen has promising sun protection.

Keywords:- Classification, Mechanism of photo protection, Sunscreen formulation, mechanism of action, advantages, disadvantages.

INTRODUCTION :-

The use of sunscreen is a necessity these days to protect our skin from the harsh ultraviolet (UV) rays. It is difficult to find good sun protection formulation which is non-greasy and moisturizing to the skin. The herbal sunscreen will not only protect the skin from the effects of harmful UV rays but also eliminate the use of chemical sunscreens. Presently, public awareness has increased regarding the safety of sunscreens using chemicals. Chemical-based sunscreen gets absorbed into the skin and causes discomfort and itchiness of the skin. UV protection is becoming very popular because of sunscreen's properties as a photo-protecting agent. In the UK and Ireland, the Boots star rating system is a proprietary in vitro method used to describe the ratio of UVA to UVB protection offered by sunscreen creams and sprays. Based on original work by Brian Diffey at Newcastle University, the Boots Company in Nottingham, UK, developed a method that has been widely adopted by companies marketing these products in the UK.



One-star products provide the lowest ratio of UVA protection, five-star products the highest. The method was revised in light of the Colipa UVA PF test and the revised EU recommendations regarding UVA PF. The method still uses a spectrophotometer to measure absorption of UVA versus UVB; the difference stems from a requirement to pre-irradiate samples (where this was not previously required) to give a better indication of UVA protection and photostability when the product is used. With the current methodology, the lowest rating is three stars, the highest being five stars. Sunscreen preparation is applied topically, and its purpose is to heal, prevent or resist skin from painful or harmful effects of sunburn, suntan, sun cancer, and premature skin aging and to escalate the level of Sun Protection Factor (SPF). Sunscreens are a natural defense mechanism to defend against precarious UV radiation from the skin, which is the outer covering layer of the body.

Herbal sunscreen also known as herbal sunblock ,suntan lotion is a lotion spray or topical products containing herbal ingredients which helps to protect from the UV radiation of the sun and hence lowering the risk of the skin cancer .

Classification of sunscreen agents:-

1. Physical sunscreen .
2. Chemical sunscreen

Physical Sunscreen :-

Those that reflect the sunlight . Physical sunscreens contain inert mineral particles that reflect the UV rays like a mirror . The most common type is ultrafine titanium oxide , made up of minute particles only 20-30 nm in size . These products have an advantage over chemical sunscreens in that they are inert substances that do not break down over time . They are far less likely to cause skin irritation , since they are in the form of insoluble particles that are not absorbed through the skin . Because of the small size of the particles , modern physical sunscreens reflect the radiation in the UVB and short UVA regions better than earlier products .

Chemical Sunscreen :-

Those that absorb the UV light sunscreen agents for external use only the use of sunscreen as photo protecting agents for UV protection . The sunscreen formulation which when applied topically protects the treated area from sunburn depends on its ability to protect against UV induced sunburn and its chemopreventive activity . The main mechanism of skin damage by UV radiation is the formation of Reactive Oxygen Species (ROS) that interact with proteins lipids and subsequently alter them . UVB and to a lesser extent UVA are responsible for inducing skin damage .

IDEAL PROPERTIES OF THE SUNSCREEN :-

1. Anticancer property
2. Safety stability of the active compound
3. Must absorb a broad range of UV rays causing sunburn
4. Must be stable in presence of sunlight
5. Should be able to provide complete protection of skin
6. Should be safe effective, chemically inert at low concentration
7. Should not stain filtering
8. Activity against UVB and UVA radiation
9. Anti-mutagenic property
10. Booster effect

ADVANTAGES OF HERBAL SUNSCREEN :-

1. Easily available .
2. Do not provoke allergy .
3. Cheap in cost .
4. No side effect .
5. Renewable resources .
6. Be natural .
7. Be stable to heat .
8. Easy to manufacture .
9. Botanical ingredients are easily available .
10. Lasts longer when in direct UV light .

DISADVANTAGES OF HERBAL SUNSCREEN :-

1. They are difficult to hide taste and colour
2. Manufacturing process are time consuming and complicated
3. Herbal drug have slow effect as compare to allopathetic dosage form it also requires long term therapy .

ADVANCES IN SUNSCREEN :-

1. Nano sunscreen
2. Sun spores
3. Sunscreen sprays
4. Roll on sunscreen
5. Sunscreen for childrens .

OBJECTIVES:-

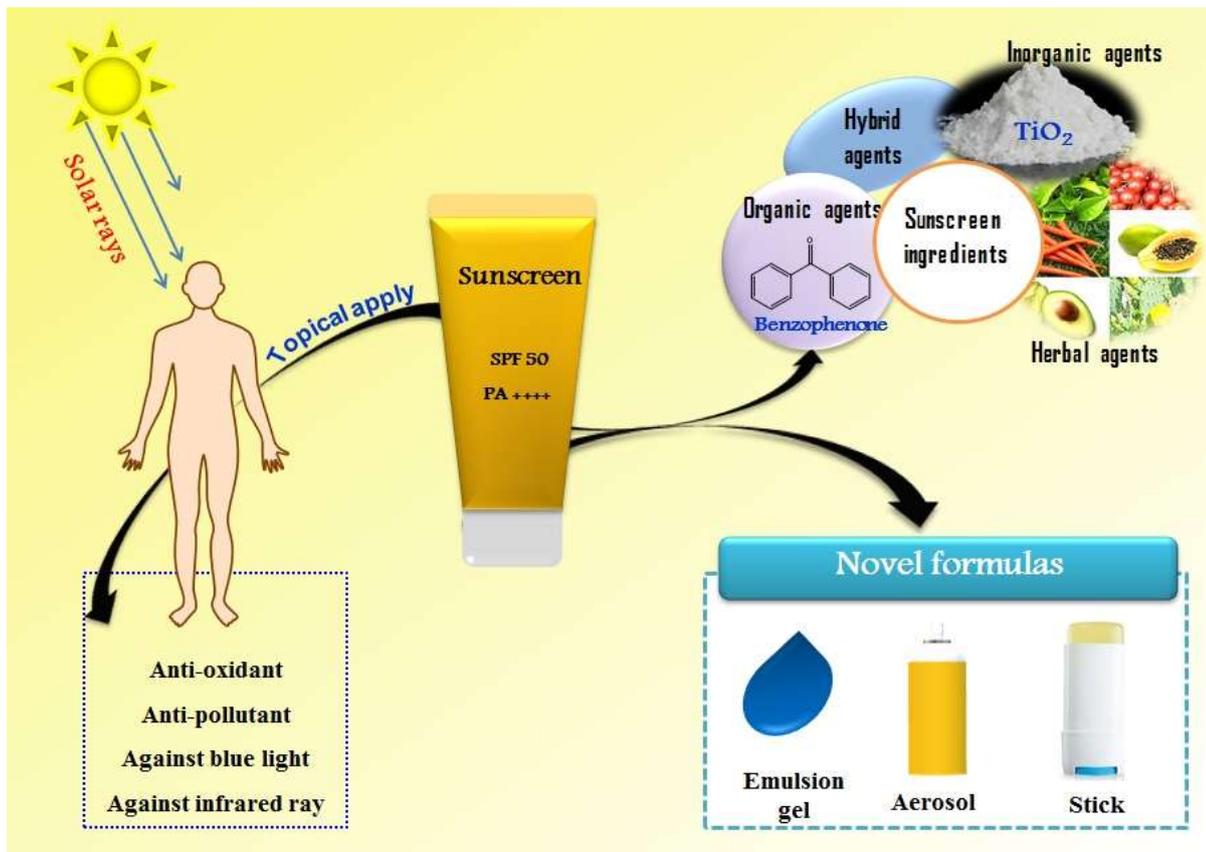
1. To develop sunscreen formulation using herbal ingredients .
2. To perform physiochemical characterization .
3. To achieve maximum stability of formulation .
4. To achieve maximum UV protecting effects
5. Sunscreen inhibit the transmission of UV radiation into the skin by reflecting , absorbing or scattering such radiation .

MECHANISM OF PHOTOPROTECTION :-

UV rays mediated photo oxidative damage reaches the dermal capillaries via epidermis and dermis and cause depletion of enzymatic and non enzymatic antioxidants in stratum corneum , epidermis and dermis . photo oxidation of pre existing melanin an dits precursor will occur which in immediate and persistent pigment darkening .

Sunscreen act by preventing and minimizing the damaging effect of the ultraviolet sunrays following exposure to the sunscreen have been demonstrated to increase the tolerance of the skin to uv exposure . They work on the two mechanism :

Scattering and reflection of uv energy from the skin surface mineral based on inorganic sunscreen works on this mechanism they provide a coating that block the sunrays from penetrating through the skin .



when exposed to an artificial sunlight source. In the US, such an in vivo test is required by the FDA. It can also be measured in vitro with the help of a specially designed spectrometer. In this case, the actual transmittance of the sunscreen is measured, along with the degradation of the product due to being exposed to sunlight. In this case, the transmittance of the sunscreen must be measured over all wavelengths in sunlight's UVB–UVA range (290–400 nm), along with a table of how effective various wavelengths are in causing sunburn (the erythema action spectrum) and the standard intensity spectrum of sunlight (see the figure). Such in vitro measurements agree very well with in vivo measurements.[attribution needed]

Numerous methods have been devised for evaluation of UVA and UVB protection. The most-reliable spectrophotometric methods eliminate the subjective nature of grading erythema.[83]

The ultraviolet protection factor (UPF) is a similar scale developed for rating fabrics for sun protective clothing. According to recent testing by Consumer Reports, UPF ~30+ is typical for protective fabrics, while UPF ~20 is typical for standard summer fabrics.

SKIN :-

Skin is the largest organ in the body and covers the body's entire external surface. It is made up of three layers, the epidermis, dermis, and the hypodermis, all three of which vary significantly in their anatomy and function. The skin's structure is made up of an intricate network which serves as the body's initial barrier against pathogens, UV light, and chemicals, and mechanical injury. It also regulates temperature and the amount of water released into the environment. This article discusses the relevant anatomical structures of the skin's epidermal layer, its structure, function, embryology, vascular supply, innervation, surgical, a considerations and clinical relevance.

Skin layers :- skin has three layers epidermis , dermis and hypodermis .

There are four types of skin explained below :

Normal skin : If your skin shows no oil or no flaking and it feels like smooth and supple , then hooray you have a normal skin type .

Oily skin : If there is lots of grease on the tissue paper , then you have an oily skin type. It is common that you might have a shine and large pores .

Dry skin :If the tissue paper is accompanied by lots of flakes and dead skin , then your skin is dry. You need to consider moisturizing your skin .

Combination : Any combination of the above mentioned skin type is a combination skin type . your skin is generally oily in the forehead and nose area and dry elsewhere.

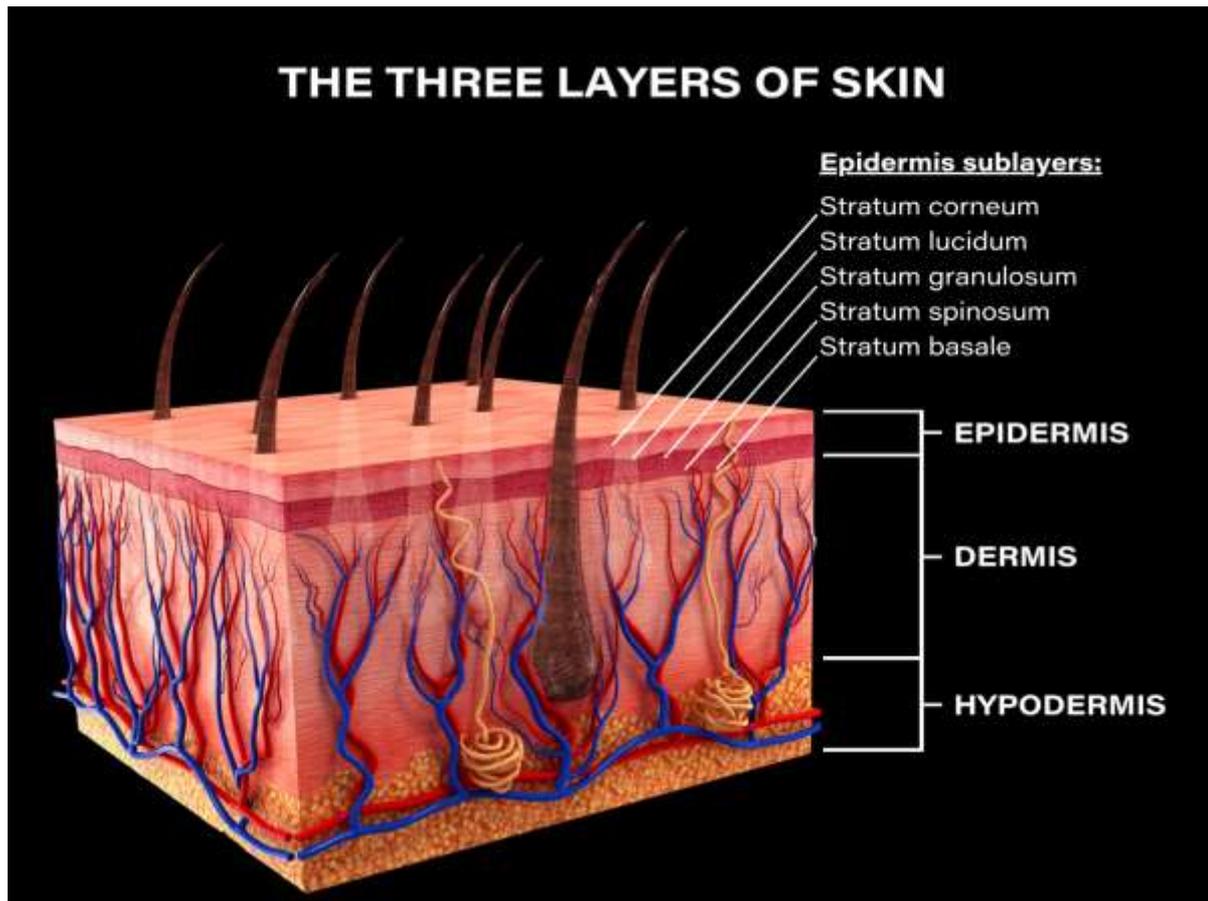
EPIDERMIS :-

The epidermis is the outermost layer. It is a waterproof barrier that gives skin its tone. It's main roles are:

- to make new skin cells
- to give the skin its color
- to protect the body from the external environment
- The epidermis constantly makes new cells in its lower layers. Over the course of around four weeks, these cells make their way to the surface, become hard, and replace the shedding, dead cells.
- Keratinocytes are the most common type of cells within the epidermis. Their job is to act as a barrier against bacteria, parasites, fungi, viruses, heat, ultraviolet (UV) rays, and water loss.
- The epidermis contains no blood vessels. The color of the skin comes from a pigment called melanin, which is produced by melanocytes. These are found in the epidermis and protect the skin from UV rays.

The five layers of the epidermis are:

- stratum corneum
- stratum lucidum
- stratum granulosum
- stratum spinosum
- stratum germinativum.



BENEFITS OF SUNSCREEN :-

Sunscreen use can help prevent melanoma[34][35][36] and squamous cell carcinoma, two types of skin cancer. There is little evidence that it is effective in preventing basal cell carcinoma. A 2013 study concluded that the diligent, everyday application of sunscreen could slow or temporarily prevent the development of wrinkles and sagging skin. The study involved 900 white people in Australia and required some of them to apply a broad-spectrum sunscreen every day for four and a half years. It found that people who did so had noticeably more resilient and smoother skin than those assigned to continue their usual practices.

A study on 32 subjects showed that daily use of sunscreen (SPF 30) reversed photoaging of the skin within 12 weeks and the amelioration continued until the end of the investigation period of one year. Sunscreen is inherently anti-ageing as the sun is the number one cause of premature ageing; it therefore may slow or temporarily prevent the development of wrinkles, dark spots, and sagging skin. A

tube of SPF 30 sunscreen on sale in the United States Minimizing UV damage is especially important for children and fair-skinned individuals and those who have sun sensitivity for medical reasons.

MATERIALS AND METHOD:

Aloe Vera :

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

Aloe vera is a good active ingredients to reach in sunscreen arsenal. It has been proven to both treat and prevent burns on your skin . the leaves od aloevera and A . Barbadensisare the source of aloevera gel . aloe vera gel is used in cosmetic lotion for its moisturising and revitalization. It blocks UVA and UVB rays and maintain skin natural moisture balance. It stops the sunburn and stimulate immune system intervention. Aloevera gel can be used to help with the healing process of sunburn it helps relive pain and redness by reducing inflammation.

Scientific Classification :

Kingdom : Plantae .

Order : Asparagales.

Family : Asphodelaceae.

Genus : Aloe .

Species : A.vera

Active components with its properties :

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

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

Mechanism of action :

Effects on skin exposure to UV and gamma radiation: Aloe vera gel has been reported to have a protective effect against radiation damage to the skin.^{12,13} Exact role is not known, but following the administration of aloe vera gel, an antioxidant protein, metallothionein, is generated in the skin, which scavenges hydroxyl radicals and prevents suppression of superoxide dismutase and glutathione peroxidase in the skin. It reduces the production and release of skin keratinocyte-derived immunosuppressive cytokines such as interleukin-10 (IL-10) and hence prevents UV-induced suppression of delayed type hypersensitivity.

Moisturizing and anti-aging effect: Mucopolysaccharides help in binding moisture into the skin. Aloe stimulates fibroblast which produces the collagen and elastin fibers making the skin more elastic and less wrinkled. It also has cohesive effects on the superficial flaking epidermal cells by sticking them together, which softens the skin. The amino acids also soften hardened skin cells and zinc acts as an astringent to tighten pores.



FIG 1:- ALOE- VERA

Butterfly pea flower :

The butterfly pea flower is scientifically called *Clitoria ternatea*. Its blue colour is stunning. It promises potential health benefits. It can colour your mixed drinks. Even cosmetic enthusiasts find a use for it. It is said to contain a lot of antioxidants which are probably responsible for its vibrant colour. Studies also propose that they have health-boosting properties.

Scientific Classification :

Kingdom : Plantae

Order : Fabales

family : Fabaceae

Genus : *Clitoria*

Species : *C. ternatea*

Packed with antioxidant:

Butterfly pea flower contain many antioxidant such as flavonoids anthocyanin and polyphenols.your skin need antioxidant to improve general health and elasticity.antioxidant help to minimize fine line and improve your skin and appearance.

Soothes minor skin irritation:

Butterfly pea flower it helped calm itching and general irritation. The butterfly pea flower used for use in rejuvenating the skin.

Reduce redness:

Because of butterfly pea flowers ability to soothe irritated skin, it also minimize redness caused by acne. Dryness and general irritation. These nourishing properties are further enhanced when combined with other nutrients that benefit skin health.

Improve moisture retention:

This helps increase skin turnover to naturally restore itself moisture retention helps stop dryness and promote lipid balance.

Improve the skin barrier:

Because butterfly pea flower contain plant based antioxidants and antioxidants vitamin such as vitamins, it help improve skin barrier.



FIG 2 :- Butterfly Pea Flower.

Coconut Oil :

Coconut oil keeps the skin soft and smooth while preventing premature ageing of the skin. Coconut oil for skin use as a moisturizer, remove dead skincells. Coconut oil moisturizing dry skin including in people with condition such as eczema. Promoting wound healing it have antibacterial, antifung and antiviral properties which prevents free radicals from causing damage to the skin. Coconut oil has anti-inflammatory properties which reduce redneeson skin this can be helpful for both dry and oily skin conditions by reducing inflammation of the skin.



FIG 3 :- COCONUT OIL .

ROSE WATER :-

A rose water is either woody perennial flowering plant of the genus rose , in the family Rosaceae or the flower it bears . There are over three hundred species and tens of thousands of cultivars. They form a group of plants that can be erect shrubs , climbing or trailing , with stems that often armd with sharp prickles . Most species are native to asia with smaller numbers native to Europe ,north america and northwestern Africa . Rose plants Range in size from compact , miniature roses to climbers that can reach seven meters in height .

Kingdom :- Plantae

Order :-Rosales

Family :-Rosacrae

Genus :- Rosa .



FIG 1 :- ROSE WATER

VITAMIN E CAPSULE :-

Vitamin E provides extra protection against acute UVB damage and protect against cell mutation caused by sun and pollution exposure . Vitamin E it help cleanse your skin and removing the impurities from and help improve skin elasticity . Vitamin E combination with lemon juice it helps to whiten the skin. It is most commonly known for its benefits of skin health and appearance it has antioxidant and anti inflammatory properties.

SUNSCREEN FORMULATIONS :-

1. EMULSION FORMULATION
2. GEL FORMULATION
3. AEROSAL FORMULATION
4. SUN STICK FORMULATION .

1.Emulsion formulation :- An emulsion is termed a lotion or creams depending on its viscosity, respectively, below 50,000 and in the range of 150,000–500,000 centipoises, providing almost unlimited versatility. It is normally produced from two unmixable liquid phases, namely “water-in oil” and “oil-in-water” emulsions. These formulations possess the ability to spread more easily on the skin and disperse from bottles. Emulsion sunscreens also provide an elegant medium that can give the skin a smooth and silky feeling without greasy shine. However, these are extremely difficult to stabilize, especially at high temperatures.

2.Gel formulation :- Sunscreen gel seems to represent an ideal vehicle from an aesthetic perspective due to its purity and elegance. It is categorized into four main forms, namely aqueous, hydro alcoholic, micro emulsion, and oil anhydrous formulations. The aqueous gel must be composed of water and solubilizers. e.g., nonionic surfactants, organic agents, and phosphate esters at sufficient proportions to ensure the gel will be transparent at all temperature. Therefore, it is easily washed away when exposed to water or sweat.

The hydro alcoholic gels are formulated by alcohol (ethanol) in conjunction with water, which are important in reducing additional solutes because most lipophilic ingredients are readily miscible in alcohol. The micro emulsion gels are composed of small particles, allowing them to appear smooth, thick, and evenly on the skin, thus delivering an elegant feel and high SPF . The oil anhydrous formula possesses many attributes similar to ointments. However, oil anhydrous products are clear, while the

ointments are translucent. These products can be produced as a gel by combining mineral oil and special silica. However, they are not widely sold because they are difficult to produce and quite expensive.

3. Aerosol sunscreen :- Aerosol sunscreens are topically applied to protect skin disorders from harmful sunlight. These products can be easily spread onto the surface of skin and distribute active ingredients to form a thin film on the skin.

4. Sun stick :- The sun stick is undoubtedly one of the most convenient products due to its small size and light weight. The sun stick is produced by two main emulsion components, namely oil and oil soluble components, through the incorporation of petrolatum and waxes. This form is subdivided into three categories, namely transparent, semi-transparent and matte sunscreen. The transparent formula contains only chemical UV filters, while semi-transparent is formulated mainly by chemical and mineral substances and matte is composed of only mineral sunscreen ingredients.

HERBAL SUNSCREEN PREPARATION :-

The regular, daily use of modern cosmetic products can potentially be very important for the long-term health of the skin. Among the most useful ingredients are sunscreens, which block ultraviolet radiation absorption by the skin, either wholly or in part. (Clothing, hats and sunglasses can all act as effective sunscreens.). The many formulations that are on sale include lotions, creams, pastes and gels, and rely on either chemical or physical agents for their protective action.

These are the most important group of preparation herbal sunscreen should either scatter the incident light effectively or they adsorb the erythema portion of the sun's radiant energy various other than the duration of exposure are also to be taken into account. Opaque powder material either used in dry state or in a vehicle.

FORMULATION OF SUNSCREEN CREAM :-

Formulation of butterfly pea flower extract :-

To make an extract of butterfly pea flower extract for herbal sunscreen take a dozen fresh or dried flower leaves in a cup of boiling water. After 15 minutes, strain the liquid and discard the leaves. The deep blue water is then ready to be used sunscreen cream.

The butterfly pea flower contain :-

Soluble minerals – 8.94 mg.

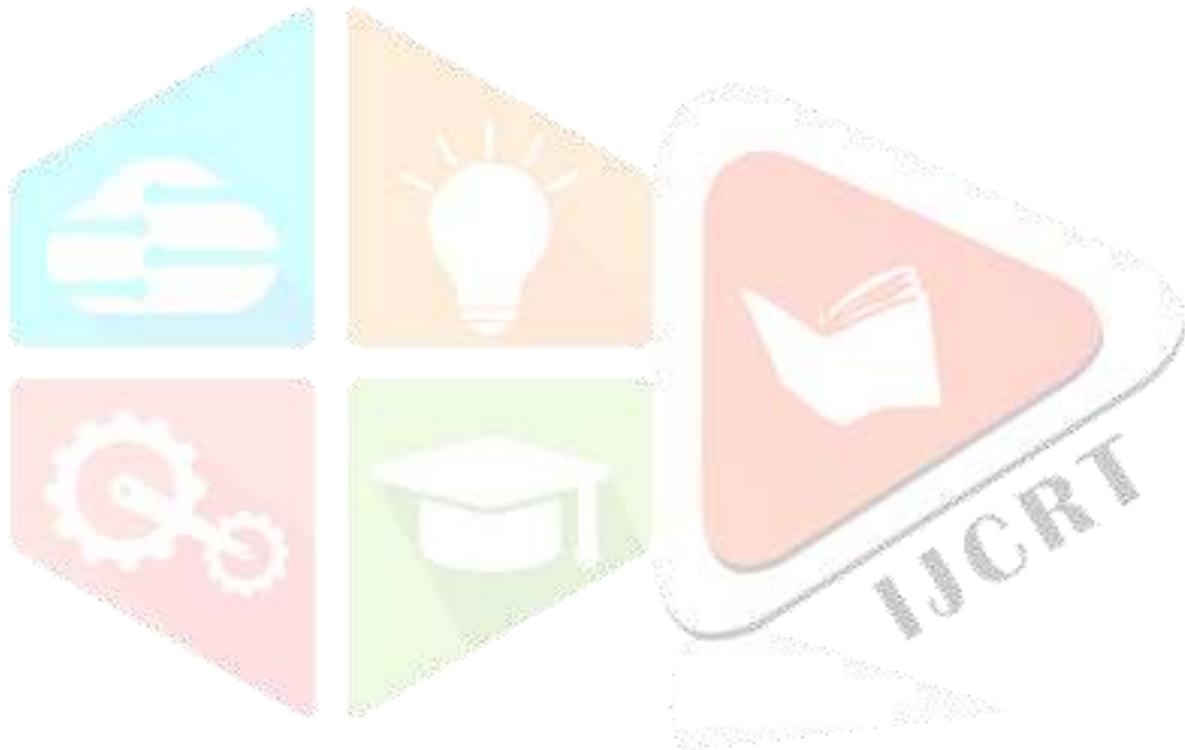
Ash – 0.94mg.

Crude protein – 41.27 mg .

Soluble carbohydrates – 29.18 mg.

List of ingredient used in formulation :-

NAME OF INGREDIENTS	WEIGHT
Aloe vera	6mg
Rose water +glycerin	2ml
Butterfly pea flower extract	4gm
Vitamin E	2gm
Coconut oil	2ml
carbopol	0.5 gm



RESULT AND DISCUSSION :-

Physical parameters :- Appearance, color ,and homogenicity were determined.

Microbial test :- As herbal products are sensitive to microbial growth, microbial assay was carried out by agar well diffusion method turbidometric method .

Organoleptic properties:- The appearance and color are included in the organoleptic property. The pH is measured and found to be 6.2 by dilution of cream in water. Viscosity was measured by using Brookfield viscometer. Cream spreadability was measured.

Chromatographic evaluation:- The contents of cosmetics products can be determined and confirmed by chromatography like TLC,HPTLC, gas chromatography .

Sun protection factor :- sun protection factor was measured with a UV 2000S transmittance analyser. The cream was placed on the polymethylmethacrylate plates were tested. Cream base without UV absorbing agents was used for blank scan. Three samples were prepared was kept in dark for 15 minutes for curing. Then the plates were scanned at three different locations and the spf value was recorded.

Stability studies :-It is carried out at elevated temperature , relative humidity , pH a period of 6 months and all above parameters are elevated periodically to conform changes in product.

Centrifugation and the freeze-thaw method were used to test stability of each herbal sunscreen. For 10 minutes, the centrifugation was carried out at the 10000rpm with 500rpm intervals, and phase separation was observed. All herbal sunscreen was stored at 20 degree and 40 degree in freeze thaw research and phase separation was noted. All of the tests were done three times .

Determination of viscosity :-The Brookfield viscometer was used to test viscosity, with the proper number of spindles selected.

Determination of ph :-The Ph of herbal sunscreen was determined using a digital ph meter . ph was measured after 1g of the formulation was dissolved in 100ml of newly prepared distilled water for 2 hours. The purpose of this study was to currently that the ph of the produced herbal sunscreen is similar to the ph of the skin after 24 hours of use. The results were triple checked and sd was recorded.

Extrudability Study

The extrudability of herbal sunscreens was determined in this study by calculating the percentage of formulation extruded from the collapsible tube based on the weight in grams necessary to extrude at least 0.5 cm of gel ribbon in 10 seconds.[43] After that, the extrudability was estimated using the formula: $Extrudability = \frac{Applied\ weight\ to\ extrude\ gel\ from\ tube\ (gm)}{Area\ (cm^2)}$.

Spreadability :-

The spreadability of herbal sunscreens determined their therapeutic efficiency. The appropriate amount of herbal sunscreen was applied between two slides, and under specified load directions, and the two sides took the time in seconds to slide off Spreadability was defined as the amount of time it took to separate two slides in less time.[43] The formula for calculating it is: $S = M \times L / t$ Where M = weight tied to upper slide L = length of glass slide T = time taken to separate the slides.

Thermal Stability:-

The oil separation from herbal sunscreens was evaluated in a humidity chamber at 60-70 % RH and 37±1°C. A 20 mm wide and 5 mm thick stripe of herbal sunscreens was applied to the internal wall of a 100 ml capacity chamber in its whole heights. The beaker was stored in a humidity chamber for 8 hours at 60-70 % relative humidity and 37°C. There should be no oil separation in the herbal sunscreen to pass the test.

Skin Irritation :-

Study Three healthy rat groups (1273/PO/Re/S/09/CPCSEA), each with six rats of either sex, were used in the skin irritation investigation. The animals were fed conventional animal feed and had unlimited access to water. Hair was shaved from the backs of the rats on one of the study days, and 5 cm² of the area was marked on both sides, with one side serving as a control and the other being tested. No reaction, slight patchy erythema, slight but confluent or moderate but patchy erythema, and severe erythema with or without edema were graded as 0, 1, 2, 3 for no reaction, slight patchy erythema, slight but confluent or moderate but patchy erythema, and severe erythema with or without edema, respectively.

What is SPF?

SPF stands for Sun Protection Factor and is the system used worldwide to determine how much protection a sunscreen provides, applied to the skin at a thickness of 2 mg/cm². The test works out how much UV radiation (mostly UVB) it takes to cause barely detectable sunburn on a given person with and without sunscreen applied. For example, if it takes 10 minutes to burn without a sunscreen and 100 minutes to burn with a sunscreen, then the SPF of that sunscreen is 10 (100/10).]

A sunscreen with a SPF of 15 provides >93% protection against UVB. Protection against UVB is increased to 97% with SPF of 30+. The difference between a SPF 15 and a SPF 30 sunscreen may not have a noticeable difference in actual use as the effectiveness of a sunscreen has more to do with how much of it is applied, how often it is applied, whether the person is sweating heavily or being exposed to water. Hence a sunscreen with SPF 15+ should provide adequate protection as long as it is being used correctly.

Determination of SPF:-

A UV Visible spectrophotometer was used to examine the in-vitro efficacy of herbal sunscreens. A 0.10 percent solution (w/v) of herbal sunscreen lotions in ethanol was made by dissolving 0.050 g of herbal sunscreen lotions in 50.0 ml of ethanol. Between 290 and 320 nm, aliquots of each herbal sunscreen were scanned at 5 nm intervals. SPF was calculated using the equation below.

Three times each sample was analysed.

$SPF = CF \sum EE(\lambda) \times I(\lambda) \times A(\lambda)$ Whereas, CF= Correction factor; EE= Erythemogenic effect; I= Intensity of solar light of wavelength; A= Absorbance.

Safety Evaluation by Mutagenicity Assay Salmonella typhimurium strain TA 100 without the S9 mix was employed in the investigation. Sodium azide (CAS Number: 26628-22-8) was used as a positive control for TA 100: 5 g/plate. As a negative control, sterile distilled water was used. Before the start of each experiment, fresh solutions of the reference mutagen were created. The samples were dissolved in dimethyl sulfoxide (DMSO) and preincubated in phosphate buffer with the test strain for 20 minutes at

37°C. The plates were incubated at 37°C for 48 hours after the test samples (herbal sunscreens) were added. The mutagenic reactions of the sunscreen compounds were assessed using a triplicate assay for each sample .

6. RESULT:-

To be effective in preventing sunburn and other skin damage ,a sunscreen product should have a wide range of absorbance .during the storage and handling of cosmetic formulation spreadability and viscosity are the prime parameter which affects the formulation acceptability.the formulated cream exhibited no redness, inflammation and irritation .when formulation were kept for long time ,it found that no change in colour of cream .The cream was easily removed by washing with tap water.

7.CONCLUSION:-

Days with sunscreen correlated not with days without risk behavior, but with days "sunbathing with the intention to tan," indicating that sunscreens were used as tanning aids to avoid sunburn. The current study aimed to create a stable herbal sunscreen with a suitable SPF. Coconut oil-based sunscreens (F5 and F6) were found to be stable, have good antioxidant activity, and have high SPF values of 33.43 and 33.50, respectively. These herbal sunscreens have also been shown to be nonmutagenic. It can be stated that the current study will hopefully lead to improvements in the treatment of sunburns produced by UV radiation exposure. The study also demonstrates that UV Spectroscopy is the most efficient, acceptable, and repeatable approach for determining the performance of herbal sunscreens. As a result, the findings of this study can help regulatory agencies, scientific organizations, and manufacturers set standardized standards for herbal sunscreens. The study attempted to develop herbal sunscreen cream using extract of butterfly pea flower and examined their efficacy for preventing sun burn.

REFERENCE :-

- 1.https://en.m.wikipedia.org/wiki/Vitamin_E.
- 2.https://www.google.com/search?q=vitamin+e+information+in+english&sca_esv=5d5b8bda91a2629d&sxsrf=ACQVn0_iG6EHY2S8v3k3Wt590q_uDQZl0g%3A1714200246396&ei=tp4sZo_YF4jd4-EPx4iwYA&oq=vitamin+e+infin+english&gs_lp=EhNtb2JpbGUtZ3dzLXdpei1zZXJwIhd2aXRhbWlulGUgaW5maW4gZW5nbGlzaCoCCAAyBhAAGAcYHjIKECEYoAEYwwQYCKi1RFCKIVjeOXACeAGQAQCYAcEEoAGGGaoBCTItNS4yLjAuMrgBACgBAPgBAZgCBqAClwzCAgoQABiwAxjWBBhHwgINEAAYgAQYsAMYQxiKBcICBxAAGIAEGA3CAggQABgIGA0YHsICChAAGAgYDRgeGA_CAggQABgHGAgYHsICCBAAGAcYHhgPmAMAIAYBkAYFkgCHMi4zLTMuMaAHoCI&sclient=mobile-gws-wiz-serp
- 3.https://www.google.com/search?q=rose+information+in+english&oq=rose+water+information+&gs_lcrp=EgZjaHJvbWUqCggCEAAYgAQYogQyCggAEEUYFhgeGDkyCAgBEAAYFhgeMgoIAhAAGIAEGKIEMgolAxAAGIAEGKIEMgolBBAAGIAEGKIEMgolBRAAGIAEGKIEMgolBhAAGIAEGKIE0gEJMTU0NjVqMGo3qAIUsAIB&client=ms-android-realme-terr1-rso2&sourceid=chrome-mobile&ie=UTF-8
- 4.<https://en.m.wikipedia.org/wiki/Rose>.
- 5.https://www.google.com/search?q=butterfly+pea+flower+active+ingredient&sca_esv=b2a24a36870244a0&biw=360&bih=700&prmd=sivnbmtz&sxsrf=ACQVn0_LnwZj6lu40nyvkhVDOPKLLIm9-Q:1713952156466&source=Inms&ved=1t:200715&ictx=111.
6. <https://en.m.wikipedia.org/wiki/Clitoria>

7. https://www.google.com/search?q=Aloe+vera+information+in+English&sca_esv=b2a24a36870244a0&sxsrf=ACQVn08uS4K9oVZ-U7lpG0MU2XZlz7KXlw%3A1713950662325&ei=xs8oZuG7E-Lu1e8P0OS36AY&oq=aloe+vera+wikipedia+in+english&gs_lp=EhNtb2JpbGUtZ3dzLXdpei1zZXJwIH5hbG9lIHZlcmEgd2lraXBIZGlhIGluGVuZ2xpc2gqAggAMgoQABiwAxjWBBhHMgoQABiwAxjWBBhHMgoQABiwAxjWBBhHHSJKVUABYAHABeAGQAQCYAQCgAQCqAQC4AQHIAQCYAgGgAhSYAwCIBgGQBgOSBwExoAcA&client=mobile-gws-wiz-serp
8. https://simple.m.wikipedia.org/wiki/Aloe_vera
9. https://en.m.wikipedia.org/wiki/File:Aloe_Vera.jpg
10. https://en.m.wikipedia.org/wiki/Talk:Butterfly_pea_flower_tea
11. https://en.m.wikipedia.org/wiki/Butterfly_pea.
12. <https://en.m.wikipedia.org/wiki/Sunscreen>
13. https://en.m.wikipedia.org/wiki/Sunscreen_Innovation_Act
14. https://www.google.com/search?client=ms-android-realme-terr1-rso2&sca_esv=d422ceb1a630167d&sxsrf=ACQVn0_hzMrWdn9uJe6DSc7w6dH91pej-A:1712815798799&q=uv+rays+effect+on+skin&uds=AMwkrPt31hO24MRRlZEnlh_1klsatuVTooh7jDyQJ s3AIfZB80QVWtjvhCWIol8ZKdCesSHSVJyW7a8LJwDbLbQ97f5x2BQ5B6yCk0ZliMUQNL-VoMKyMalpCWIXPLXJryXDUNW00m1rkljHygKvTpX_-U61TcHBRCfmleQRPaD26rlhigOLHjMoCt2CWwL6qkW6l4deQQPRuxohp7oVK6R4DdzHOuVA8eAoX-6anTpf3g5MTAp8im-5tTaFLI-9GGGU6n7ryeadgGTcPUGS3hbbejmt7Qw5CpYQAvas7LMHcspbmrVfbsGfMlsv3fZRZp5MClkpJxaojmfa342Ed2pJ_y-OebW92OJJ4aGHH-wTokwsYNIS0yiEI82etgA0hd3pEUK_kq&udm=2&prmd=ivsnbmtz&sa=X&ved=2ahUKEwir6YKKwLmFAxXK7zgGHSO8CNMQtKgLegQIDRAB&biw=360&bih=700&dpr=3.
15. <https://www.medicalnewstoday.com/articles/265800>
16. <https://simple.m.wikipedia.org/w/index.php?title=Houseplant&wprov=rarw1>
17. Medicines and Healthcare products Regulatory Agency. 2018. Emollients: New information about risk of severe and fatal.
18. Boyd AS, Naylor M, Cameron GS, et al. The effects of chronic sunscreen use on the histologic changes of dermatoheliosis. *J Am Acad Dec 1995; 33(6):941-6*
19. Fotiades J, Soter NA and Lim HW. Results of evaluation of 203 patients for photosensitivity in a 7.3-year period. *J Am Acad Dermatol. Oct 1995; 33(4):597-602.*
20. DeBuys HV, Levy SB, Murray JC, et al. Modern approaches to photo protection. *Dermatol Clin. Oct 2000; 18(4):577-90.*
21. Diffey BL and Grice J. The influence of sunscreen type on photo protection. *Br J Dermatol. Jul 1997; 137(1):103-5.*
22. Dromgoole SH and Maibach HI. Sunscreening agent intolerance: contact and photo contact sensitization and contact urticaria. *J Am Acad Dermatol. Jun 1990; 22(6):1068-78.*

23. Miss. Waghmode Monika Vasant Prof.Khade. P. Dr. HINGANE L.D. ADITYA PHARMACY COLLEGE, BEED 431122, "Formulation and Evaluation of Herbal Sunscreen Cream", 2021 IJCRT , Volume 9, Issue 12, ISSN: 2320-2882,2021.
24. PappireddyLahari, K.V. Ratnamala, "Formulation Development and Evaluation of Sunscreen", IJIRT, Volume 8 Issue 1, ISSN: 2349-6002.
25. Liyan L, Lan C, Tao H, Yunge M, Yingyan L, Ding H, et al. Natural products and extracts from plants as natural UV filters for sunscreens: A review. *Anim Models Exp Med.* 2023; 6: 183-195.
26. 31) Strobridge, J.R. Gel-Type Sunscreen Composition. U.S. Patent 4917882, 17 April 1990. [Google Scholar]
27. Hougaz, L. Sunscreen Aerosol Spray. U.S. Patent 20090061001A1, 5 March 2009. [Google Scholar]
33. Lee, S.-H. New Technical Developments in Sun Care and Blue Light Defense; SUNJIN Beauty Science: Gyeonggi-do, Korea, 2018; p. 134. [Google Scholar]
28. Mithal BM and Saha RNA. Hand book of cosmetics, first edition, reprint-2007, Vallabh Prakashan, Delhi 122-124.
29. Moloney FJ, Collins S and Murphy GM. Sunscreens: safety, efficacy and appropriate use. *Am J Clin Dermatol.* 2002; 3(3):185-91.
30. Naylor MF and Farmer KC. The case for sunscreens. A review of their use in preventing actinic damage and neoplasia. *Arch Dermatol.*

