



National Journal of Pharmaceutical Sciences

E-ISSN: 2788-9270

P-ISSN: 2788-9262

www.pharmajournal.net

NJPS 2024; 4(1): 16-26

Received: 10-01-2024

Accepted: 14-02-2024

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Development and evaluation of a natural sunscreen lotion with skin friendly ingredients

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Abstract

Sun consists of dangerous radiation which affects the skin, and sunscreen is a chemical emulsion that help cover you from UV shafts' sunburn is caused by ultraviolet B radiation but ultraviolet a may be more dangerous to the skin. Sunscreen should immaculately block both wavebands. The end of this study was to develop herbal topical sunscreen expression grounded on some fixed canvases, in combination with some medical shops. Regular use of sunscreen reduces the development of actinic keratosis, scaled cell melanoma and carcinoma. Sunscreen may be organic or inorganic chemicals. Sunscreen is also known as sunblock embrocation. The product that absorbs or reflects the sun's ultraviolet radiation and protects the skin. The adding prevalence of skin cancers and print damaging goods caused by ultraviolet radiation has increased the use of sun webbing agents, which have shown salutary goods in reducing the symptoms. Sun screening agents should be safe chemically inert, on-irritating on-toxic, print stable and suitable to give complete protection to the skin against damage from solar radiation. The Ultraviolet radiations are of 3 types of Ultraviolet A, Ultraviolet B and Ultraviolet C. This composition gives a detailed review on different types of Ultraviolet radiation. To cover our skin from Ultraviolet radiation sunscreen phrasings are used which either absorbs couples or reflects the radiation. The dangerous goods on skin like print aging, skin cancer, DNA damage are explained. The present review explains the colorful types of sunscreen phrasings and the agents used for the purpose of sun webbing. The agents are two types of physical and chemical sun screening agents. The physical agents which block the sun and the chemical agents which absorb the sun are listed and explained. To know the efficacy of the expression sun protection factor computation is done. The equation used to calculate the Sun Protection Factor value is explained in detail. The ultraviolet spectroscopic system is employed to calculate the Sun Protection Factor. The proposed system is set up to be easy and rapid-fire for the computation of Sun Protection Factor values in the *in vitro* studies. Herbal expression is more profitable than the chemical expression because of its smaller side goods. Many herbal sunscreen agents are listed and explained its exertion ^[1].

Keywords: SPF, Sunscreen, herbal, topical formulation, efficacy, ultraviolet radiation

Introduction

In India, dress is defined as any composition intended to be rubbed, poured, sprinkled, or scattered on, or introduced into, or else applied to the mortal body or any part thereof for sanctification, beautifying, promoting attractiveness or altering the appearance, and includes any composition intended for use as a element of dress. Now-a-days one ornamental product order sunscreen has gained wide fissionability due to fresh health benefits to the skin. Either separate sunscreens or numerous other sunscreens loaded ornamental products for skin care, hair care, lips watch, and eye care are available. This review tries to epitomize all possible issues related to sunscreen from the dawn of humanity, Sun is source of life and energy. But recent studies accept sun as main malefactor of injurious goods including acute goods (e.g., sunburn and medicine- convinced print toxin) and habitual pitfalls of frequent sun shaft exposure like sunburn, crack, carcinoma and saturation, cancer and vulnerable suppression. 1 Sun shafts are most dangerous environmental factor which affects skin, beget sun burn, skin cancers and print ageing. Due to these dangerous goods of UV radiation, there's need to develop sunscreen expression to heal, help sun burn, suntan, skin cancer and unseasonable skin ageing and to increase position of Sun Protection Factor. The main thing of sunscreen expression is to block UV shafts and increase the position of protection from the UV - Shafts. The crucial factors of UV protection are flavonoids, phenolic composites, or herbal canvases due to their UV shaft's immersion capacity in UV - A region and their antioxidant exertion. Cell mutation, DNA damage, hormone revision and eczema like antipathetic response are some adverse goods of the synthetic sunscreen agents.

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Sunscreen phrasings available in request slip doesn't have parcels like crack enigmatic-inflammatory, cooling, and anti-ageing. Again, free revolutionary intermediated skin damages cannot be cured until and unless free radical scavengers aren't available in print defensive products. The primary use of sunscreens is to cover the skin from the short- term and long- term goods of ultraviolet radiation. In moment's script sunscreens have come a necessary part of all cases post procedure skin care routine. During the request check, it's set up that there are so numerous sunscreen phrasings available in requests which are used in

protection of skin from UV shafts. Colorful phrasings have different sun protection exertion on base of their efficacy of UV shafts' immersion, but maximum phrasings are of high cost and incorporated synthetic motes are with implicit toxin and indeed carcinogenesis. Hence there's need to develop and estimate effective and safe sunscreen product which can give result to sunburn, injuries, cracks, wrinkles, unseasonable ageing, and antioxidant constituents to help in protection of long-term dangerous goods of sunrays intermediated free radical.

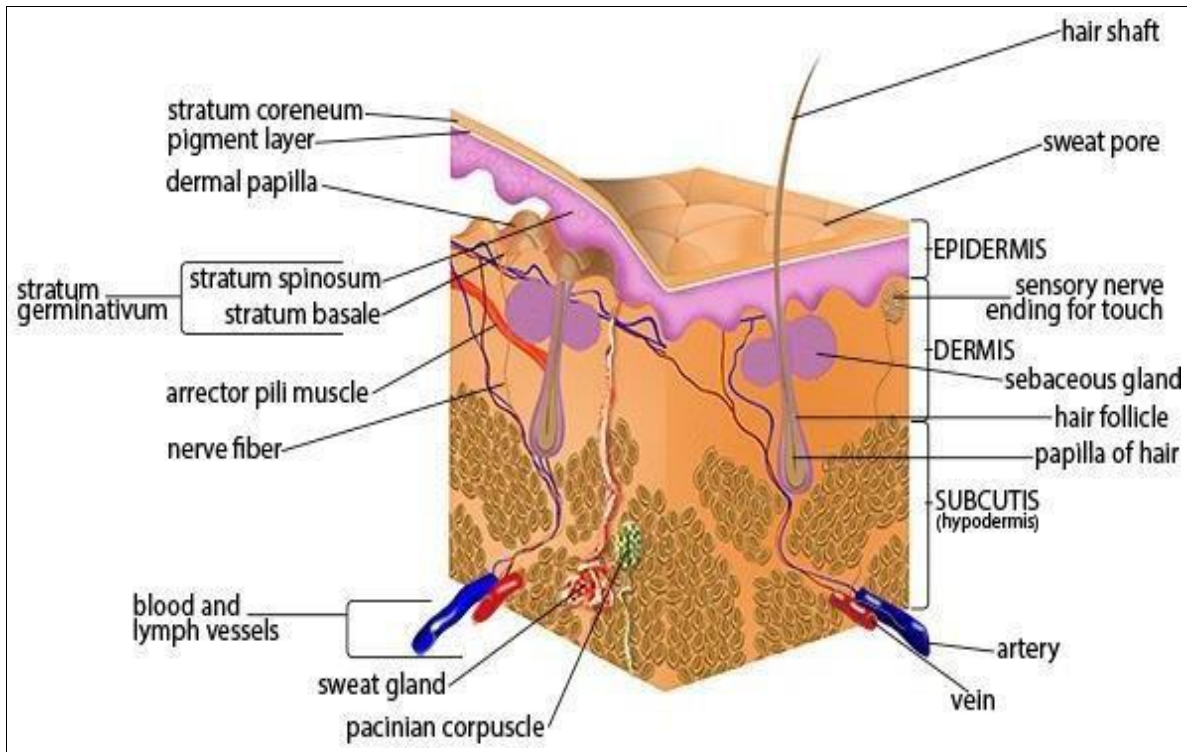


Fig 1: Schematic of human skin anatomy Reproduced with permission from SEER Training Modules, Skin Cancer: Melanoma

Anatomy of the skin

The skin is the body's largest organ. It covers the entire body. It serves as a defensive guard against heat, light, injury, and infection. The skin also:

- Regulates body temperature.
- Prevents water loss.
- Prevents entry of bacteria.
- Acts as a hedge between the organism and its terrain
- Helps to make vitamin D when exposed to the sun.

Skin Consistence The consistence of each subcaste of the skin varies depending on body region and distributed grounded on the consistence of the epidermal and dermal layers. Furless skin set up in the triumphs of the hands and soles of the bases is thickest because the epidermis contains a redundant subcaste, the stratum lucidum. The upper reverse is considered thickest grounded on the consistency of the dermis, but it's considered "thin skin" histologically because the epidermal consistency lacks the stratum lucidum subcaste and is thinner than furless skin.

Layers of Epidermis

The layers of the epidermis include the stratum Basale (the deepest portion of the epidermis), stratum spinosum, stratum granulosum, stratum lucidum, and stratum corneum (the

most superficial portion of the epidermis) [2]. Stratum Basale, also known as stratum germinativum, is the deepest subcaste, separated from the dermis by the basement membrane (rudimentary lamella) and attached to the basement membrane by hemidesmosomes. The cells set up in this subcaste are cuboidal to columnar mitotically active stem cells that are constantly producing keratinocytes. This subcaste also contains melanocytes. Stratum spinosum, 8-10 cell layers, also known as the jag cell subcaste contains irregular, polyhedral cells with cytoplasmic processes, occasionally called "backbones", that extend outward and communicate neighboring cells by desmosomes. Dendritic cells can be set up in this subcaste. Stratum granulosum, 3-5 cell layers, contains diamond shaped cells with keratohyalin grains and lamellar grains. Keratohyalin grains contain keratin precursors that ultimately aggregate, crosslink, and form packets. The lamellar grains contain glycolipids that get buried in the face of the cells and function as cement, keeping the cells stuck together. Stratum lucidum, 2-3 cell layers, present in thicker skin set up in the triumphs and soles, is a thin clear subcaste conforming of eleidin which is a metamorphosis product of keratohyalin., 20-30 cell layers, is the upmost subcaste, made up of keratin and wanton scales made up of dead keratinocytes, known as anucleate scaled cells. This is the

subcaste which varies utmost in consistence, especially in callused skin. Within this subcaste, the dead keratinocytes cache defensins which are part of our first vulnerable defense. Cells of the Epidermis o Keratinocytes o Melanocytes o Langerhans' cells o Merkel's cell.

Keratinocytes

Keratinocytes are the predominant cell type of epidermis and appear in the rudimentary subcaste, produce keratin, and are responsible for the conformation of the epidermal water hedge by making and concealing lipids. Keratinocytes also regulate calcium immersion by the activation of cholesterol precursors by UVB light to form vitamin D.

- Melanocytes are deduced from neural crest cells and primarily produce melanin, which is responsible for the color of the skin. They're set up between cells of stratum Basale and produce melanin. UVB light stimulates melanin stashing, which is defensive against UV radiation, acting as a erected- in sunscreen. Melanin is produced during the conversion of tyrosine to DOPA by the enzyme tyrosinase. Melanin also travels from cell to cell by a process that relies on the long processes extending from the melanocytes to the neighboring epidermal cells. Melanin grains from melanocytes are transferred via the long processes to the cytoplasm of rudimentary keratinocyte. Melanin transferred to neighboring. Keratinocytes by "color donation"; involves phagocytosis of tips of melanocyte processes by keratinocytes [3].
- Langerhans' Cells Langerhans cells, dendritic cells, are the skin's first line protectors and play a significant part in antigen donation. These cells need special stains to fantasize, primarily set up in the stratum spinosum. These cells are the mesenchymal origin, deduced from CD34 positive stem cells of bone gist and are part of the mononuclear phagocytic system. They contain Birbeck grains, tennis chatter shaped cytoplasmic organelles. These cells express both MHC I and MHC II motes, uptake antigens in skin and transport to the lymph knot.
- Merkel Cells Merkel cells are round- shaped modified epidermal cells set up in stratum Basale, directly above the basement membrane. These cells serve a sensitive function as mechanoreceptors for light touch, and are most vibrant in fingertips, though also set up in the triumphs, soles, oral, and genital mucosa. They're bound to adjoining keratinocytes by desmosomes and contain intermediate keratin fibers and their membranes interact with free whim- whams consummations in the skin.
- Dermis The dermis is connected to the epidermis at the position of the basement membrane and consists of two layers of connective towel, the papillary and reticular layers which combine together without clear discrimination. The papillary subcaste is the upper subcaste, thinner, composed of loose connective towel and connections epidermis. The reticular subcaste is the deeper subcaste, thicker, less cellular, and consists of thick connective towel/ packets of collagen filaments. The dermis houses the sweat glands, hair, hair follicles, muscles, sensitive neurons, and blood vessels.

Hypodermis

The hypodermis is deep to the dermis and is also called

subcutaneous fascia. It's the deepest subcaste of skin and contains adipose lobules along with some skin accessories like the hair follicles, sensitive etc.

The functions of the skin

- Protection against microorganisms, dehumidification, ultraviolet light, and mechanical damage; the skin is the first physical hedge that the mortal body has against the external terrain.
- Sensation of pain, temperature, touch, and deep pressure starts with the skin.
- Mobility the skin allows smooth movement of the body [4].
- Endocrine exertion the skin initiates the biochemical processes involved in Vitamin D product, which is essential for calcium immersion and normal bone metabolism.
- Exocrine exertion this occurs by the release of water, urea, and ammonia. Skin secretes products like sebum, sweat, and pheromones and exerts important immunologic functions by concealing bioactive substances similar as cytokines.
- Impunity development against pathogens.
- Regulation of Temperature. Skin participates in thermal regulation by conserving or releasing heat and helps maintain the body's water and homeostatic balance [5].

Objectives

- To develop sunscreen expression using herbal constituents.
- To develop colorful phrasings.
- To perform physiochemical characterization.
- To achieve maximum stability of lotions.
- To achieve maximum UV guarding agents.
- To cover the skin from the radiations by using different types of expression.
- Protection from conditions.

Mechanism of photoprotective agents

Sun has a long list of positive goods on living beings. Life on Earth relies on the capability of photosynthetic organisms to make good use of solar energy and convert it into chemical energy. The world as we know it's shaped by the capability of our eyes to respond to incoming light. The metabolism of vitamin D in humans is regulated by solar radiation. These are just some exemplifications of the benefits handed by the sun. On the other hand, we should also bear in mind that the sun can also pose a peril to life. The injurious goods of solar radiation on different organisms have been known for a long time. DNA damage, photoinhibition, skin cancer is just some of the pitfalls that different types of organisms must face. In Nature, elaboration has developed different photoprotective mechanisms that allow living beings to manage the dangerous goods of light. The biosynthesis of explosively absorbing composites and substances suitable to dissipate light energy works together with antioxidant composites to avoid damage by the Sun. In turn, humans have learnt from these natural photoprotective strategies to design and prepare artificial composites that can minimize the damage of sun to our skin. In this Special Issue, some of the most recent advances in the study of natural sunscreens and the development of artificial composites for photoprotection are presented [6]. Nature is full of exemplifications of well-

designed moles able to efficiently guarding organisms from direct sun and reactive oxygen species (ROS) formed after irradiation. Melanin is a family of composites set up in mortal skin related with photoprotection and saturation. Assis Oliveira *et al.* report a computational approach to gain N NMR shifts of a subset of these colors in water. Monomers, dimers, and tetramers of eumelanin are considered. BML-111, a commercially available agonist of the ALX/ FPR2 receptor, seems a promising medicine for the reduction on the goods of UVB light. Martinez *et al.* Report on its use in furless mice [7]. The use of excerpts from natural sources is also a promising way to gain sustainable sunscreens while adding value to the else useless remainders. In this sense, Pan and associates report the use of excerpts from Phoebe henna wood, substantially containing alcohols and olefins, and useful for the medication of UV shielding flicks. Using natural composites as alleviation, numerous different artificial photoprotective composites have been designed and prepared. Specific conditions for named operations or the need to fulfil relatively strict consumer requirements have guided the hunt for new and advanced sunscreens. Following this trend, resend andco-authors report the use of new xanthones to cover the skin from photoaging. In this Special Issue, we collect some reviews from the leading experimenters in the field. These benefactions give a comprehensive view of some of the most applicable composites in photoprotection. Gliosis *et al.* Explore the natural part of neoxanthin, a color set up in shops and algae. The review from Abiola and associates focuses on the use of ultrafast spectroscopy and computational styles to understand the photoprotective medium of some natural composites. Deming- Adams andco-authors present a complete review on the natural places and parcels of zeaxanthin and lutein, carotenoids set up in photosynthetic organisms. The use of melanin- related composites for their use as UV pollutants and ROS scavengers is reviewed by Solano Sunscreens could also be used to control the way photochemical responses take place by filtering specific wavelengths. This conception is developed by Eigvi and Lem coff in their review. The benefactions to this Special Issue stress the significance of photoprotection and its connections to different scientific fields. We still have a lot to learn from Nature when it comes to the design of effective sunscreens, but this a trouble that we need to face to defend ourselves from the dangerous goods of sun.

Classification of Sunscreen

Sunscreen is classified as either topical or systemic grounded on the route of administration topical sunscreen are divided into two classes on their medium of protection.

- Organic sunscreen.
 - Inorganic sunscreen.
- **Organic sunscreen**
Workshop by absorbing into skin and converting UV shafts into heat. It is thin and ideal for everyday use allow for skincare constituents to be added fluently. Organic sunscreen actives chemical carbon-grounded emulsion it contains mineral active components.
 - **Inorganic sunscreen**
These are patches that scatter and reflect uv shafts back to the terrain they act as physical hedge to indent ultraviolet and UV light. They're considered broad

diapason as they cover entire ultraviolet diapason the Inorganic sunscreen are also appertained to as sunblock [8].

Effect of UV on skin

The best-known acute effect of inordinate UV exposure is erythema, the familiar skin glowing nominated sunburn. Sun light is substantially of wavelength from UV to visible light. UV is the ultraviolet radiation which is of three divisions similar as UVA is of 320- 400 nm, UVB is of 290- 320nm and UVC is of 100-290 nm. Solar radiation exposure has negative effect over the mortal skin. UV is the most dangerous radiation which may beget sunburns and skin cancers. Advanced exposure of UV radiation may also beget print vexation, print aging and carcinogenesis. In addition, utmost people will tan from the UV stimulation of melanin product, which occurs within many days following exposure. A farther, less egregious adaptive effect is the thickening of the remotest layers of the skin that attenuates UV penetration to the deeper layers of the skin. Both changes are a sign of damage to the skin. Vulnerability to skin damage depends on skin type; individuals with fairer skin will be more prone to sunburn or erythema, than people with darker skin also, the capability [9] to acclimatize to UV exposure (suitable to tan) also depends on skin type.


- UVA has long wavelength which access and reach the nethermost subcaste of the skin which causes tanning and aging of skin. It's murderous which increase the dermal seditious cells and destroy the epidermal antigen exertion which is present in the epidermal Langerhans cells. It also accelerates reactive oxygen species (ROS) which causes damage to cells and produces immunosuppressive cytokines.
- UVB has a short wavelength and enters the epidermis and small quantum into the dermis. It generates pyrimidine dimmers in DNA and damage the structure of DNA. Like UVA it also produces ROS which damages the skin cell and produces immunosuppressive cytokines.
- UVC doesn't reach the face of skin. It's blocking habitual exposure to UV radiation also causes several degenerative changes in the cells, stringy towel, and blood vessels of the skin. These include dots, nevi and lentigines, which are painted areas of the skin, and verbose brown saturation. UV radiation accelerates skin aging, and the gradational loss of the skin's pliantness results in wrinkles and dry, coarse skin.

Ingredients

Neem oil

(*Azadirachta indica*) commonly known as neem, is a tree in the mahogany family- Liliaceae. It is one of two species in the genus AZADIRACHTA.

Table 1: Botanical Classification

Kingdom	Plantae	
Clade	Rosids	
Class	Dicotyledons	
Family	Meliaceae	
Genus	Azadirachta	
species	A. indica	

Chemical constituents of neem

Leaves containing ingredients such as Nimbin, Nimbanene, 6-desacetylnimbinene., Nimbandiol, Nimbolide, ascorbic acid, N hexacosanol and amino acid, 7-desacetyl-7-benzoylazadiradion, 17-hydroxyazadiradione, and Nimbiol [10].


Uses

- Nourish the skin.
- Treats fungal infections.
- Useful in detoxification.
- Increase immunity.
- Treat wounds, treats acne.

Lavender oil

Lavandula (Common Name Lavender) is a genus of 47 known species of flowering plants in the mint family, Lamiaceae. It is native to the Old World and is found in Cape Verde and the Canary Islands, and from Europe across to northern and eastern Africa, the Mediterranean, southwest Asia to India [11].

Table 2: Botanical classification

Kingdom	Plantae	
Clade	Asterids	
Order	Lamiales	
Family	Lamiaceae	
Genus	Lavandula. L	
Species	<i>Lavandula Spica L.</i>	

Chemical Constituents

The main constituents of lavender are linalool, linalyl acetate, 1, 8-cineole, β -ocimene, terpinen-4-ol, and camphor [12].

Uses

- Could Help Treat Skin Blemishes.
- May Offer a Natural Remedy for Pain.
- Reduce Blood Pressure and Heart Rate.
- Could Relieve Asthma Symptoms.
- Lessens Menopausal Hot Flashes
- Help combat fungus Growth.
- Potentially Promotes Hair Growth
- Diabetes Management.
- May Help Bone


Turmeric extract

Turmeric is a flowering plant, *Curcuma longa*, of the ginger family, Zingiberaceae, the rhizomes of which are used in cooking. The plant is a perennial, rhizomatous, herbaceous plant native to the Indian subcontinent and Southeast Asia that requires temperatures between 20 and 30 °C (68 and 86 °F) and high annual rainfall to thrive. Plants are gathered each year for their rhizomes, some for propagation in the following season and some for consumption [13].

Chemical constituent

The main active components of the rhizome are the nonvolatile curcuminoids and the volatile oil. Curcuminoids (curcumin, demethoxycurcumin, and bisdemethoxycurcumin) are nontoxic polyphenolic derivatives of curcumin that exert a wide range of biological activities [14].

Table 2: Biological classification

Kingdom	Plantae	
Clade	Commelinids	
Order	zingiberales	
Family	zingiberaceae	
Genus	Curcuma	
Species	c. longa	

Uses

1. Could Help Heal Acne. This works on several levels.
2. Lightens Hyperpigmentation.
3. Deals with Dull Skin.
4. Reduces Dark Circles.
5. Protects Against Environmental Damage.
6. Prevents Premature Aging
7. Could Help Psoriasis and Eczema.

Antiseptic effect Aloe Vera contains 6 antiseptic agents Lupeol, salicylic acid, urea nitrogen, cinnamomic acid, phenols and sulfur. They all have inhibitory action on fungi, bacteria and contagions." "Using Aloe Vera on the face can help moisturize skin. Regularly applying a small quantum of Aloe Vera to the face can help treat colorful skin conditions, including acne, eczema, and sunburn [15]. A person can use the gel directly from an Aloe Vera factory or buy a bottled variety from a health store [16].

Vitamin capsules

Vitamin E is a group of eight fat answerable composites that include four tocopherols and four tocotrienols. Vitamin E insufficiency, which is rare and generally due to an beginning problem with digesting salutary fat rather than from a diet low in Vitamin E, can beget whim-whams problems Vitamin E is a fat-answerable antioxidant which may help cover cell membranes from reactive oxygen species.

Worldwide, government associations recommend grown-ups consume in the range of 3 to 15 mg per day.



Fig 1: Vitamin capsules

Chemical Constituents

"Vitamin E is a group of eight fat answerable composites that include four tocopherols and four tocotrienol.

Uses


Vitamin E is a fat-answerable vitamin that acts as an antioxidant, helping cover cells from damage throughout

your body. It's set up in our sebum (skin oil painting), which creates a natural hedge to keep humidity in your skin. So soapy skin shells, like the face, contain lesser quantities of vitamin E.

Black tea extract

Black tea (also literally translated as red tea from various East Asian languages), is a type of tea that is more oxidized than oolong, yellow, white and green teas. Black tea is generally stronger in flavour than other teas. All five types are made from leaves of the shrub (or small-tree) *Camellia sinensis*, though *Camellia taliensis* is also used rarely. [17].

Table 3: Biological classification

Kingdom	Plantae	
Clade	Asterids	
Order	Ericales	
Family	Theaceae	
Genus	<i>Camellia</i>	
Species	<i>C. sinensis</i>	

Chemical constituent

"Black tea (*Camilla sinensis*) contains several polyphenols, including aflavin, flavanols (in particular catechins and gallic acid), theaflavins, and phenolic acids" [18].

Uses

- "Fights signs of ageing.
- Aids in sun protection.
- Rejuvenates the skin from the inside out [19].
- Fights skin infections.
- Fades the appearance of blemishes.
- Reduces puffiness.

Shea butter

"Shea butter Bambara: *Situlu* is a fat (triglyceride; mainly oleic acid and stearic acid) extracted from the nut of the African shea tree (*Vitellaria paradoxa*). It is ivory in color when raw and commonly dyed yellow with borututu root or palm oil. It is widely used in cosmetics as a moisturizer, salve or lotion. Shea butter is edible and is used in food preparation in some African countries. Shea butter is mixed with other oils as a substitute for cocoa butter, although the taste is noticeably different" [20].

Chemical Constituents

"Shea butter is composed of five principal fatty acids: Palmitic, stearic, oleic, linoleic, and arachidic" [21].

Uses

- "It boosts skin moisture.
- Its anti-inflammatory properties soothe skin problems.
- It could heal cuts and scrapes.
- It helps fight breakouts.
- Antioxidants may mean anti-aging properties.

Chrysanthemums Extract

- "Chrysanthemums, sometimes called mums or chrysanths, are flowering plants of the genus *Chrysanthemum* in the family Asteraceae. They are native to East Asia and northeastern Europe. Most species originate from East Asia and the center of diversity is in China.

- Countless horticultural varieties and cultivars exist [22].




Fig 2: Shea butter

Chemical Constituent

Camphor, borneol, camphene, α -pinene, p-cymene and 1, 8 cineole.

Table 5: Biological Classification

Kingdom	Plantae	
Clade	Tracheophytes	
Order	Asterales	
Family	Asteraceae	
Genus	<i>Chrysanthemum</i>	
Species	<i>Chrysanthemum indicum</i>	


Uses

Chrysanthemum is used to treat chest pain and headache, dizziness, and swelling.

Aloe Vera gel

Aloe Vera is a succulent plant species of the genus *Aloe*. It is widely distributed and is considered an invasive species in many world regions.

Table 6: Biological classification

Kingdom	Plantae	
Clade	Tracheophytes	
Order	Asparagales	
Family	Asphodelaceae	
Genus	<i>Aloe</i>	
Species	<i>A. Vera</i>	

Chemical constituent

Aloe Vera contains 6 antiseptic agents: Lupeol, salicylic acid, urea nitrogen, cinnamomic acid, phenols and sulfur. They all have inhibitory action on fungi, bacteria and contagions.

Uses


"Using *Aloe Vera* on the face can help moisturize skin.

Regularly applying a small quantum of Aloe Vera to the face can help treat colorful skin conditions, including acne, eczema, and sunburn [23]. A person can use the gel directly from an Aloe Vera factory or buy a bottled variety from a tea.

Almond oil

The almond (*Prunus Amygdalus*, syn. *Prunus dulcis*) is a species of tree native to Iran and surrounding countries, [4] including the Levant. The almond is also the name of the edible and widely cultivated seed of this tree. Within the genus *Prunus*, it is classified with the peach in the subgenus *Amygdalus*, distinguished from the other subgenera by corrugations on the shell (endocarp) surrounding the seed. The fruit of the almond is a drupe, consisting of an outer hull and a hard shell with the seed, which is not a true nut. Shelling almonds refers to removing the shell to reveal the seed. Almonds are sold shelled or unshelled. Blanched almonds are shelled almonds that have been treated with hot water to soften the seedcoat, which is then removed to reveal the white embryo. Once almonds are cleaned and processed, they can be stored over time. Almonds are used in many food cuisines, often featuring prominently in desserts, such as marzipan [24].

Table 7: Biological classification

Kingdom	Plantae	
Clade	Rosids	
Order	Rosales	
Family	Rosaceae	
Genus	<i>Prunus</i>	
Species	<i>P. Amygdalus</i>	

Chemical constituents

Almonds contain lipids (around 50%), proteins (around 25%) and carbohydrates (around 20%), and have a low moisture content and diverse minor bioactive compounds [25].

Uses

The skin of the almonds is rich in fibre due to the presence of polyphenols. They also act as protective agents against cardiovascular disease and cancer. It has been found in animal studies [26].



Fig 8: Zinc oxide powder

Zinc oxide powder

Zinc oxide is an inorganic emulsion with the formula ZnO. It's a white greasepaint that's undoable in water. ZnO is used as an cumulative in multitudinous accoutrements and products including cosmetics, food supplements, rubbers, plastics, pottery, glass, cement, lubricants, maquillages, sunscreens, ointments, bonds, sealants, colors, foods, batteries, ferrites, fire retardants, semiconductors, and first-aid videotapes. Although it occurs naturally as mineral zincite, utmost zinc oxide is produced synthetically.

Uses

Zinc Oxide (Zingk OX ide) is used to treat or help minor skin vexations similar as backs, cuts, and diaper rash. Some products may be used as sunscreen. This drug may be used for other purposes; ask your health care provider or druggist if you have questions.

Triethanolamine

Triethanolamine is a tertiary amino compound that is ammonia in which each of the hydrogen is substituted by a 2-hydroxyethyl group. It has a role as a buffer and a surfactant. It is a tertiary amino compound, a triol and an amino alcohol. It is functionally related to triethylamine [27].

Uses

- Used as a surface acting agent.
- Used as a stabilizer.
- It's a corrosion inhibitor.
- Used as an herbicide and algicide.

Materials and Methods

Extraction of lavender

We took a part of lavender flower, then we kept it under the sun, after that we pour it into a jar with ethanol for 2 weeks and we shake it diurnal formerly, after the 2 weeks we got the extract of lavender.

Extraction of neem

We took neem leaves after that it is air dried, later transferred it into the motor pestle, after a while we just add little water on that, then we triturate it properly. Distilled water should be used for that test. We are triturating for 10-20 beats we got the neem extract, and we discard the remaining remainders.

Turmeric

Turmeric contains the curcumin as a active phytoconstituents and we just simply take some turmeric from market and dried it. After a while we are doing water extraction.

Aloe Vera

We took a part of Aloe Vera from shop than we scoop out its jelly by remove the first chines of the flake and flat side of skin. Use a spoon to scoop out the transparent aloe gel. For farther smooth consistence we just blend it.

Black Tea

We bought tata Agni black tea for using, from the market.

Almond Oil

We took some almond and we roast it for a period. After roasting we blend it in a mixer, and we get the almond oil.

Chrysanthemum Extraction

We took the flower part of chrysanthemum and air dried it for two days and keep it in coconut oil for 2 weeks in a penetrable vessel and daily we shake it. After 2 week we got the oil extract of chrysanthemum.

Vitamin E

We simply got vite from vite capsules which we buy from medical shop.

Zinc oxide

We took zinc oxide from the laboratory.

Shea butter

We are buying shea butter from the market.

Triethanolamine

We collect triethanolamine from the college laboratory.

Methods

The following steps are involved in the formulation of a herbal sunscreen.

Preparation of the water phase

- In a beaker, combine 4 g of Aloe Vera gel, 2 ml of turmeric extract, 1 ml of black tea extract, 2 g of zinc oxide, and 2ml of neem extract.
- Stir the mixture for 10-15 minutes until it is well combined.
- The mixture should be a high dense liquid.

Preparation of the oil phase:

- In a China dish, combine 8g shea butter and 800mg vitamin E.
- Add different oils, we used 2ml almond oil.
- Add the main ingredients such a 3g of chrysanthemum extract and 1ml of lavender oil.
- Place the China dish on a heated water bath and boil for 20 minutes, stirring continuously and add triethanolamine slowly as it is a surface- active agent.
- After boiling, let the mixture cool down.

Combining the water and oil phases

- Slowly pour the high viscous liquid material from the beaker into the oil phase in the China dish, stirring continuously.
- Continue stirring until the mixture is well combined.
- The sunscreen lotion is now ready to use.

Formulation Table

Ingredients	Quantity
Aloe Vera	6 gm
Turmeric	2 ml
Vitamin e	800 mg
Shea butter	3 gm
Zinc oxide	4 gm
Black tea	1 ml
Almond oil	2 ml
Chrysanthemum	3 gm
Lavender oil	1 ml
Neem extract	1 ml
Triethanolamine	2 ml
Water	Q.S.

Evaluation Tests

Irritancy Test

In the evaluation test irritancy test is an important parameter. Topicals constituents are applied on the skin and the are occasionally antipathetic and hypertensive on some case and they can form oedema and erythema on the skin. As we're using herbal products so occasionally irritant agents might be there so for checking that regular irritancy test should be performed for 24 hours and reported.

Erythema 0 - No Erythrema 1 - Small Erythrema 2 - Visible Erythrema 3 - Medium Erythrema 4 - Severe Erythrema Edema no Edema 1 - Small Edema 2 - Visible edema 3 - Medium Edema 4 - Severe edema junking Test Sunscreen will be applied on skin like on face, hand, and legs along with others part so for that it should fluently junking after using. Easy junking after using increase the convenience of using the sunscreen, so junking test should be done and reported.

Feel test

In this test we will test the sunscreen directly on the skin and we will find what it feels like. After applying the sunscreen, we will feel whether we feeling any burning sensation or any cool sensation. The emolliency, greasiness would be checked and reported.

Types of film forming

Which type of smear is forming after applying the sunscreen should be checked and estimated. What type of film it's forming should be reported.

Homogeneity

By touch and visual appearance, we can fluently check the homogeneity of the sunscreen.

Spreadability

It's an important parameter for a sunscreen that the spreadability indicator of the cream. How fluently it's spread and how important residue present after rubbing would be checked. Another bone process is there for spreadability test in which we will just simply take a sample of slides and sunscreen will be applied in between the two slides and after that took the time to slide off. It's defined as the time taken for separate the slides. A formula is there which is. $T = W * L/T$ Where, T = Time W = Weight Tied to upper slide, L = Length of the slide.

Appearance

By seeing the expression and judged by its colour, pearlescence and consistence and roughness we can fluently do the appearance test.

Viscosity

The expression can be tested by Brookfield viscometer at 100rpm. For measuring its proper consistence and roughness. A proper number of spindles will elect. Herbal sunscreen was measured at 5, 10, 50, 100, etc. further the result will cipher using the factor attained from the test.

PH of the Sunscreen

Right pH should be tested for the expression of sunscreen for better stability and better goods. PH would be measured by pH cadence in a buffer result for that in 50 ml of distilled water we've to dissolve 0.5 g of cream and by seeing the

colour on the pH cadence we will be suitable to determine the pH of the sunscreen. This system will repeat for numerous times, and it results will be checked by further than two times. If there are any difference than it should be recorded.

Thermal stability

Thermal stability plays a prominent part in the evaluation test of sunscreen. Stability of the sunscreen expression in accelerated temperature is to be measured. Its helps to define remedial efficacy and shelf life of the sunscreen. In this test we will increase the temperature in a specific range, and we will check in which temperature it's degrades.

In vitro occlusion test

Complete content of the face of the skin indicates occlusion of skin. The exclusivity of cream can be measured by occlusion factor $F = 100 * A - B / A$ where A = water loss without sample and B = water loss with sample. Sludge paper covered water- filled teacup system is used then. The minimal occlusion factor is 0 which indicates no occlusion effect and maximum occlusion factor is 100 which indicate

Observation

1. Organoleptic test

Formula	Colour	Odour	Homogeneity
F1	Cream like yellowish	Aromatic	Uniform and homogeneous in nature
F2	Cream like yellowish	Aromatic	Uniform and homogeneous in nature
F3	Cream like yellowish	Characteristics	Uniform and homogeneous in nature
F4	Cream like yellowish	Characteristics	Uniform and homogeneous in nature

2. Evaluation test

Formula	F1	F2	F3	F3
SPF value	30.1	32.3	28.6	31.2
Spreadability	Good spreadability	Good spreadability	Good spreadability	Good spreadability
Removal test	Easily removal	Easily removal	Easily removal	Easily removal
Feel test	Cool sensation	Cool sensation	Cool sensation	Cool sensation
Irritancy test	No irritation and oedema persist	No irritation and oedema persists	No irritation and oedema persist	No irritation and oedema persists
Ph	6.8	7.1	6.8	7.3
Saponification Value	18.1	20.3	23.6	24.1
Viscosity	190	210.5	188.5	213
Occlusion test	68	65	72	69
Thermal Stability	Stable in accelerated temperature	Stable in accelerated temperature	Stable in accelerated temperature	Stable in accelerated temperature

Objectives

- Decreases the threat of skin cancer.
- It gives Protection against sunburn.
- It helps to avoid inflammation and greenish ness on the skin.
- Avoid piebald skin and hyperpigmentation.
- Sunscreen helps to stop DNA damage.
- Help the early onset of wrinkles and fine lines and early ageing.
- It acts as a guard from dangerous UV shafts.
- Sunscreen maintain the brilliance of your natural complexion on skin.
- Maintain the look and texture of your skin.
- Reflects UVA and UVB shafts and prevents their dangerous goods.
- It shows quick onset when applied on the skin

complete face content by topical expression.

Determination Sun Protection Factor (SPF) in UV-Spectrophotometer

First keep the skin under the sun and check that how much time takes to form a slight burn on skin, and then apply little amount of the sunscreen and check again how much time take to form an erythema.

Then calculate the ratio of both the time

$$\text{SPF} \equiv \frac{\text{Time taken to form an erythema with sunscreen}}{\text{Time taken to form an erythema without sunscreen.}}$$

Saponification value

Introduce about 2 gm of substance refluxed with 25 ml of 0.5 N alcoholic KOH for 30 minutes, to this 1 ml of phenolphthalein added and titrated immediately, with 0.5 N HCL. Saponification value = $(b-a) \times 28.05/w$ the volume in ml of titrant = a volume in ml of titrant =b the weight of substance in gm^[28].

Advantages

- Fluently available in the request.
- No side goods or lower side goods.
- No special outfit is demanded for medication.
- They're affordable and constituents are fluently available for the medication.
- Renewable coffers are uses for medication and it's non-toxic and non-irritant in nature.
- Be neutral and increase compliance.
- Easy to manufacture.
- Sunscreen sprays and Roll- on sunscreen
- Sunscreen for children

Disadvantages

- They're delicate to hide taste and odour.
- Manufacturing process are time consuming and

complicated.²⁸

- Herbal medicines have slow goods as compared to allopathic lozenge form it also requires long term remedy.
- Still not respectable that important by the population.
- Occasionally precious and not available fluently.
- Lower chemical and physical stable.
- It can beget occasionally irritancy, inflammation, greenish ness on skin.

Results

The sunscreen formulation was evaluated for its sun protection factor (SPF). The SPF was determined by measuring the amount of UV radiation that was blocked by the formulation. The formulation had an SPF of 30, which is high. The formulation was also evaluated for its photostability. The photostability was determined by measuring the amount of sunscreen actives that were lost after exposure to UV radiation. The formulation was found to be photos table, with only a small loss of sunscreen actives after exposure to UV radiation.

Discussion

The results of this study show that the herbal topical sunscreen formulation is effective in protecting the skin from UV radiation. The formulation has a high SPF and is photostable. The formulation is also made with natural ingredients, which makes it safe and gentle on the skin.

Conclusion

The herbal topical sunscreen formulation developed in this study is a safe and effective way to protect the skin from UV radiation. The formulation is made with natural ingredients and has a high SPF and photostability. The formulation is a promising alternative to conventional sunscreens and can be used to prevent skin cancer sun burn and premature skin ageing.

Though we used natural and herbal ingredients so it's also cheaper than the marketed ingredients and non-allergic and non-irritant. Day by day the incidents of skin cancer and others skin disorder are increasing so this natural sunscreen lotion is a wonderful formulation to prevent such skin disorders. Due to less chemical contain as compare than the marketed products and it has the good protection efficacy from the UV radiation.

Acknowledgement

This dissertation is the end of our journey is obtaining our b. pharm degree. This dissertation has been kept on track and been seen throughout completion with the support and encouragement of numerous people including our guide, our well-wishers and our friends.

At the end of our b pharm, I would like to thank all those people who made the day possible and an unforgettable experience for us.

It is a delightful moment for me to express our gratitude and sincere thanks to beloved Prof. Dr. Kavita PN Director and principle, KR College of pharmacy, for her generous support and encouragement given to us and all the necessary help and facilities provided.

I would take pride in tendering our deep sense of gratitude and heartfelt thanks to esteemed research guide Assist Prof Mrs. Mahalaxmi KS for her

invaluable guidance and constant encouragement throughout our research work.

I am especially grateful to our family members for their care and support.

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