



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

“FORMULATION AND EVALUATION OF PHYSICAL SUNSCREEN”

Ms. Shabnam Rahim Sheikh^{1st}, Ms. Jayshree Anil Wasudev^{2nd}

Ms. Jagruti Anil Keskar^{3rd}, Mr. Saqlain Khan Gaffar Khan^{4th}

Guidance By: Assit Prof. Ms. Pooja G. Sakharkar^{5th}

M. Pharm (Quality Assurance)⁵

Students ¹²³⁴

Ishwar Deshmukh Institute of Pharmacy Digras, Maharashtra, India¹²³⁴⁵

ABSTRACT:

The aim of the present study was to formulate and evaluate Physical Sunscreen by the turmeric Powder sandalwood powder extract successively with ethanol in Soxhlet's apparatus and Carrot oil is used. Sunscreen cream was formulated by ethanolic extract and tested Physicochemical parameters such as colour, Odour, texture, spreadability, pH, viscosity, Homogeneity and appearance, drug content and patch test for irritancy respectively. SPF of the formulation determined by Economic Testing & Research Laboratory Govt. Approved Lab & ISO-9001 Certified. The Sunscreen containing ethanolic extract of turmeric powder sandalwood, carrot Oil, titanium dioxide, under study drug content at wavelength of 254 nm observed and SPF 21 which is normal. So we can positively conclude that our sunscreen significantly contributes in the preparation of cosmetic formulation which could prevent skin with harmful effect of Ultraviolet radiation. It also helps in broadening the UV protection ability of the sunscreen. Along with the greatest advantage of avoiding the adverse and undesired effect of synthetic and chemical sunscreen compounds.

KEYWORDS:

Turmeric Powder, Sandalwood Powder, Carrot Oil, Titanium Dioxide, Sun Protection Factor (SPF), Bees Wax.

INTRODUCTION:

Since the beginning of time, the sun has been a source of life and energy. However, new Research acknowledge that the sun is the primary cause of harmful consequences, including Immediate symptoms like sunburn. Chronic dangers from repeated exposure to the sun's rays include sunburn, cracks, melanoma, Pigmentation, cancer, and immunological suppression. The most damaging environmental factor for skin is sunlight, which can result in sunburn, Skin cancer, and premature ageing of the skin. Due to these negative effects of UV radiation, Sunscreen formulations need to be developed in order to heal, prevent sunburn, suntan, skin Cancer, and premature ageing of the skin, as well as to enhance the amount of SPF.²

Blocking UV radiation and boosting UV protection are the two main objectives of sunscreen Composition. Due to their ability to absorb UV rays in the UV-A area and their antioxidant Activity, flavonoids, phenolic compounds, and herbal oils are the primary components of UV Protection.³ Synthetic sunscreen ingredients have some negative side effects, including cell mutation, DNA damage, hormone changes, and allergic reactions resembling eczema. Market-available. Sunscreen compositions lack qualities including cooling, anti-inflammatory, wound healing, And anti-aging. Again, free radical-mediated skin damage cannot be reversed as long as photo Protection agents contain free radical scavengers.⁴ During the market research, it was discovered that there are numerous sunscreen formulations That may be utilised to shield skin from UV radiation. Varying formulations offer varying sun protection properties based on how well they absorb UV rays, however most formulations are expensive and contain synthetic compounds that Could be harmful or even carcinogenic.⁵ Thus, there is a need to create and assess effective and secure sunscreen products that can Treat sunburn, wounds, cracks, wrinkles, and premature ageing, and which also contain Antioxidant chemicals to assist defend against the long-term detrimental effects of free Radicals caused by the sun.

- **SUNSCREENS :-**

Sunscreen, commonly referred to as suncream or sunblock, is a lotion, spray, gel, or other Topically applied preparation that absorbs or reflects some ultraviolet (UV) light from the sun, Thereby assisting in the prevention of sunburn. Sunscreen is a component of skin-lightening Products because lighter skin is more vulnerable to sun damage than darker skin. Many Sunscreens contain tanning powder to help the skin darken or tan, but tanning powder doesn't Offer UV protection. Sunscreens can be divided into two categories based on their mechanism Of action.

- **PHYSICAL SUNSCREENS :**

Physical sunscreens contain active minerals that sit on top of the skin to scatter and deflect Harmful UV rays away from the skin, such as zinc oxide or titanium dioxide. They are Frequently called "physical blockers." Physical blockers are thick, opaque, and greasy Medicines that provide practically total protection. The physical blockers red petrolatum, Titanium oxide, and zinc oxide provide good UVA and UVB protection. Physical blockers Also have the advantage of being waterproof .

• CHEMICAL SUNSCREENS :

Chemical sunscreens comprise organic (carbon-based) substances including oxybenzone, Octinoxate, octisalate, and avobenzone that operate by converting UV radiation into heat and Then expelling that heat from the skin through a chemical process. Chemical agents that are Frequently employed as sunscreens can be broadly divided into four types. They are also Known as chemical or organic absorbers.

AMINO BENZOIC ACID DERIVATIVES:

- Para amino benzoic acid (PABA): Absorbs UVA radiation only.
- Padimate O: Extensive UVB protection.

ii) Benzophenones:

- Avobenzone: Extensive UVA protection, limited UVB protection.
- Dioxybenzone and oxybenzone: Partial UVA protection, extensive UVB protection.
- Sulisonbenzone: Absorbs most UVB radiation, some UVA radiation.

iii) Cinnamates:

- Cinoxate: Limited UVA protection extensive UVB coverage.
- Octocryline and Octyl methoxycinnamate: Extensive UVB and limited UVA Protection.

iv) Salicylates:

- Homosalate and Octyl salicylate: UVB absorption only.
- Trolamine salicylate: Extensive UVB protection.⁶

1. TURMERIC (Curcuma Longa)

The curcumin found in turmeric can help wounds heal by decreasing inflammation and oxidation. It also lowers the response of your body to cutaneous wounds. This results in your wounds healing more quickly.

Roles:

- Anti-inflammatory
- Anti-oxidant
- Anti-microbial

- Anti-ageing



Fig. 1: Turmeric

2. SANDALWOOD :

About 25 species of semiparasitic plants in the genus *Santalum* make up sandalwood, with *Santalum album*, the true, or white, sandalwood, being particularly aromatic. The group is Dispersed across Southeast Asia, Australia, and South Pacific island groups.

Role :-

- anti-inflammatory
- antimicrobial
- antiproliferative, or inhibits undesirable cell growth.
- antiviral



Fig. 2: Sandalwood

HEALTH BENEFITS :

1. HELPS KILLS FUNGI AND BACTERIA :

The ability of carrot seed oil to eradicate particular bacteria and fungus has received the greatest attention from researchers. For a variety of reasons, some of the viruses it is effective against are indeed worrisome. If properly developed, the oil might offer a novel strategy to combat various diseases, many of which are widespread in developing countries.

The fungus and bacteria that appear to be most impacted by it are listed below:

Dermatophytes : These fungus need keratin to develop. Direct contact with infected Individuals, animals, or soil can result in dermatophyte infections, which commonly affect the hair, skin, and nails. Studies demonstrate the antifungal effects of carrot seed oil.

Alternaria alternata : This fungus, which can cause crop rot and blight, grows on leaves, making it particularly dangerous for farmers who have few resources. Carrot seed oil aids in combating it.

Escherichia coli: Diarrhea, anemia, and kidney failure are all possible side effects of an E. coli infection.

The oil's antimicrobial properties work to prevent it

Acinetobacter : Strains of the gram-negative bacterium Acinetobacter cause a number of serious infections. The oil was revealed in studies to help kill it. okay, so the last one isn't a virus; it's a mosquito called Aedes albopictus. However, it's important since this Asian tiger mosquito's larvae can be killed by carrot seed oil. Zika, yellow fever, dengue fever, and a number of other deadly diseases are frequently carried by Aedes albopictus mosquitoes.

2. MAY FIGHT CANCER CELL :

Researchers routinely examine substances in the fight against cancer by starting in the lab and determining what effect, if any, they have on various cancer cell lines. Carrot seed oil has been shown in laboratory experiments to have anticancer activities against breast cancer, colon cancer, and acute myeloid leukaemia cell lines. carrot seed oil was found to be highly effective in a study on animals looking at how it affected skin cancer, namely squamous cell carcinoma in rats.

3. INCLUDED AS A PART OF NATURAL SUNSCREEN OPTION :

A 2009 study on the advantages of carrot seed oil was released by an Indian institution and is frequently cited. According to a number of publications, the study determined that it had an SPF of about 40, making it an effective UV-blocking agent. well, nearly. But not quite. The actual purpose of the study was to determine how SPF from natural products with varied

herbal constituents might be evaluated. Researchers discovered that a product with several herbal constituents, such as carrot seed oil, actually has an SPF of around 40. It's unlikely that carrot seed oil on its own actually

provides a significant enough SPF to be Used in place of chemical-rich, conventional sunscreens because of the way natural

Ingredients combine to form the SPF found in the tested product.

4. POWERFULL ANTIOXIDANT :

Carrot seed oil has potent antioxidants that can aid in disease prevention, just like many other oils and essential oils. particularly, the liver-protective properties of these polyphenols have been investigated in animal experiments. The liver is protected from harm by carrot seed oil, which also offers significant defence against the cell-damaging oxidative stress and free radicals.

5. SUPPORT SKIN AND HAIR HEALTH :

Carrot seed oil has long been used as an effective moisturiser for both skin and hair. although there are no studies to support its usefulness for moisturising characteristics, it is safe for topical application and might contribute to these advantages. Due to the high concentration of antioxidants, it may be able to prevent damage to skin and hair.

HOW TO USE :

Consider the quality of what you buy, as you should with other oil-related products, and only ever make purchases from reliable, ethical vendors. Always cold-press carrot seed oil from organic carrots (if available).

Keep in mind that carrot oil, carrot seed oil, and carrot seed essential oil differ significantly form one another, so be sure to pay great attention to what you're actually buying. While carrot seed essential oil is steam-distilled and can be made from either the seeds or the carrot

Itself, carrot seed oil is pressed from wild carrot seeds.

Carrot seed oil has a distinct aroma, yet it may be utilised in a variety of aromatherapy

techniques and in essential oil diffusers. Another way to benefit from its various advantages is to apply it straight to the skin.

One component of my homemade face scrub, carrot seed oil, can help exfoliate dead skin cells and leave your skin feeling soft and radiant. This scrub's blend of chemicals may help to restore dry, damaged skin and even help prevent wrinkles.

MATERIAL :

Sr. No	Name of Chemicals	Supplied By
1	Turmeric Powder	By local vendor in pure form
2	Sandalwood	B.Pharm pharmacy chemical room
3	Carrot Oil	Devherbs
4	Titanium Di-oxide	Supplied by Qualigens

Table No 1 : List of material and respective supplier

Sr.No	Equipment's	Make
1	1 UV Spectrophotometer	
2	2 Viscometer	Brookfield viscometer
3	3 Digital pH meter	
4	4 Digital Balance	
5	5 Homogenizer	

Table No 2 : List of Equipment's

FORMULATION OF PHYSICAL SUNSCREEN WITH TURMERIC EXTRACT, SANDALWOOD EXTRACT, CARROT OIL.

METHODS :**1. Determination of calibration curve (by UV Spectroscopy of curcumin.)**

- Determination of calibration curve (by UV Spectroscopy of curcumin.)

Materials:- All chemicals used were of analytical reagent grade. The chemical reagents prepared on experiment day.

Procedure :- preparation standard solution of curcumin of UV visible spectroscopy.

Curcumin 10mg was accurately weighed and transferred in a 100ml volumetric flask.

Methanol was added upto the mark to obtain a concentration of 100 μ g/ml of Stock solution. From Stock solution 0.1, 0.2, 0.3, 0.4, 0.5 ml of solutions were withdrawn and diluted to 10ml with methanol to obtain concentrations of 1, 2, 3, 4, 5 μ g/ml, respectively.

Determination of maximum wavelength by UV Visible Spectroscopy :Curcumin 1,2,3,4,5 μ g/ml solution was scanned in UV Spectrophotometer in the range of 200-800nm methanol was used as blank. Wavelength corresponding to maximum absorbance of curcumin in methanol was observed at 424nm.

Preparation of standard calibration curve of Curcumin by UV Visible :

Spectroscopy ,The standard calibration curve of curcumin was obtained by measuring the absorbance of curcumin solution in concentration range (1-5µg/ml) prepared from stock solutions in methanol at 424 nm in triplicate. Calibration curve of curcumin was then plotted with absorbance on y-axis and curcumin concentration on x-axis.^{23,24}

Formulation of Sunscreen:-

Step1:- Water phase was prepared by collecting deionized water (73%) and then (5%)

water was remove aside from this for final volume makeup. Water soluble

components disodium EDTA, sodium methyl paraben and triethanolamine were

dissolved in deionized water; meanwhile carbopol was allowed to swell using a homogenizer and heated up to 80°C

Step2:- Oil phase was prepared by heating sodium propyl paraben, stearic acid, cetyl

alcohol, bees wax, Cetosteryl alcohol and ethanolic extract at 80 °C.

Step 3:- Oil phase was added in water phase at 80°C with continuous stirring for 20-25 min and then it was homogenized till uniform emulsion is formed. The finished product has yellow color and gel like consistency. It was then poured into the wide mouth container and stored at temperature not exceeding 37°C.

Evaluation of physical sunscreen :

The prepared curcumin cream was observed visually and homogeneity, grittiness, viscosity, spread ability, pH, and its stability studies were recorded.

1.Viscosity:-

Using a Brookfield viscometer, the viscosity of the formulated physical sunscreen I cream was measured by pouring the physical I cream into the viscometer adaptor and then observed the angular velocity that was 4 and then increased to reach 10rpm.²⁵

2.Homogeneity & Appearance:-

After the cream has been set in the container, the formulation was tested for homogeneity by visual appearance and by physical touch. The appearance was determined by examining the pearlscence, the roughness, and the color.²⁶

3.Patch test for irritancy:-

To ensure sunscreen is free from adverse effects a sensitivity study using path test for irritancy was done.²⁷

4.Grittiness:-

Formulation was evaluated with the help of compound microscope to observe for the presence of any particles.²⁸

5.Determination of pH:-

A calibration by a standard buffer solution was done to the pH meter and then 0.5g of the formulated physical cream was taken and mixed properly with 50 ml distilled water. Then, the pH of the cream was determined by the pH meter at room temperature.²⁹

6.Spreadability:-

Spread ability is measured by time in seconds utilized by two glass slides to slip off from cream, lesser time taken for separation of two slides, denotes the better the spreadability. measuring the spreadability was done by adding 3g of the herbal cream between two slides and pressed it to get a thin layer which is uniform and then a 1000g weight was placed for 5.

RESULT & DISCUSSION :

Results and discussion

Authentication of Drug :

Visual inspection:

Physical appearance of drug was examined for following organoleptic properties

1. Turmeric powder

Color:- yellow

Taste:-mildly fragrant and has a slight ginger-like bite.

State:- yellow powder form.

2.Sandalwood powder

Color:-Brown

Taste:-bitter

State:-Brown powder form.

3. Carrot oil

Color:- yellow or amber-colored to pale orange-brown .

Taste:-spicy taste and pleasant aroma.

State:- pale orange-brown oil.

SUMMARY & CONCLUSION :

In present research work we have prepared physical sunscreen with an objective of improving cosmetic formulation. Physical sunscreen was prepared by ethanolic extract of curcumin longa determination of λ_{max} is 424 nm absorbance , calibration curve of curcumin at 424 nm is absorbed. .

Physicochemical test : Colour – dark yellow , Odour – characteristics , Spreadability – good

and uniform , pH – 6.42 , Viscosity (cps) – 833 cps , Patch test for irritancy – no irritation reaction found . Drug content phosphate buffer 7.4 pH, absorbance at 254 nm is observed , SPF value 21 , Drug stability study over a period of three months . The physical appearance , pH value , drug content to be observed periodically after second and third month of preparation. The stability of formulated of physical sunscreen test under the different temperature 20 C , 25 C and 35 C. hence it was concluded that physical sunscreen which was prepared with the good and uniform texture of cream with the pH of 6.42 and spreadability also good and uniform on skin with SPF of 21 so we could say it is safe and effective on skin from harmful rays. The greatest advantage that it will not show any adverse or undesired effect like chemical and synthetic sunscreen product.

REFERENCES :

1. Balogh TS, Velasco MV, Pedriali CA, Kaneko TM, Baby AR. Ultraviolet radiation protection: current available resources in photo protection. An Bras Dermatol. 2011;86(4):732-42.<http://dx.doi.org/10.1590/S0365-05962011000400016>;PMid:21987140.
2. Skotarczak K, Osmola-Mankowska A, Lodyga M, Polanska A, Mazur M, Adamski Z. photoprotection: facts and controversies. Eur Rev Med Pharmacol Sci. 2015;19(1):98-112.PMid:25635982.
3. Kaimal S, Abraham A. Sunscreens. Indian J Dermatol Venereol Leprol. 2011;77(2):238-4.<http://dx.doi.org/10.4103/0378-6323.77480>;PMid:21393968.
4. Saraf S, Kaur CD. Phytoconstituents as photo protective novel cosmetic formulations. Pharmacogn Rev. 2010;4(7):1-11.<http://dx.doi.org/10.4103/0973-7847.65319>;PMid:22228936 PMCID:PMC3249896.
4. Asaka, T., Ishikawa, K. ed.: Quality Assurance Guidebook, Union of Japanese Scientists and Engineers Publications, 1974.
5. Text book of cosmetic science concepts and principles, as per PCI regulations by Dr.Kamal Pathak & Dr.Ankur Vaidya Pg no. 7.2 to 7.4.
6. Handbook of cosmetic science and technology third edition by Andre O. Barel ,Marc Paye & Howard I. Maibach.
7. International Journal of cosmetic science by S.Gause & A.Chauhan .9
8. 1.Balogh TS, Velasco MV, Pedriali CA, Kaneko TM, Baby AR. Ultraviolet radiation Protection: current available resources in photo protection. An Bras Dermatol.2011;86(4):732-42.<http://dx.doi.org/10.1590/S0365-05962011000400016>;PMid:21987140
9. 2.Skotarczak K, Osmola-Mankowska A, Lodyga M, Polanska A, Mazur M, Adamski Z. Photoprotection: facts and controversies. Eur Rev Med Pharmacol Sci.2015;19(1):98-112.PMid:25635982.

10. 3.Asaka, T., Ishikawa, K. ed.: Quality Assurance Guidebook, Union of Japanese Scientists . And Engineers Publications, 1974.
11. 4.Text book of cosmetic science concepts and principles,as per PCI regulations by Dr. Kamal Pathak & Dr.Ankur Vaidya Pg no. 7.2 to 7.4.
12. 5.Sambandan DR, Ratner D. Sunscreens: An overview and update. Journal of the American Academy of Dermatology. 2011;64:748-758.
13. 6.Murphy GM. Sunblocks: Mechanisms of action. Photodermatology, Photoimmunology & Photomedicine. 1999;15(1):34-36.
14. 7.Bissonnette R, Allas S, Moyal D, Provost N (2000) Comparison of UVA protection afforded by high sun protection factor sunscreens. J Am Acad Dermatol 43: 1036-1038.
15. 8.Sayre RM, Agin PP, Levee GJ, Marlowe E (1979) A comparison of in vivo and in vitro testing of suncreening formulas. Photochem Photobiol 29:559.
16. 9.Walters C, Keeney A, Wigal C, Johnston C, Cornelius R (1997) The Spectrophotometric Analysis and Modeling of Sunscreens. J Chem Edu 74: 99.
17. 10.Autier P, Boniol M, Severi G, Dore JF (2001) Quantity of sunscreens used in European students. Brit J Dermatol 144: 288.

