



Research Article

Marigold and Raspberry Sunscreen: A Natural Way to Protect Your Skin from Sun Damage

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ABSTRACT

The creation of an herbal sunscreen lotion with more skin-friendly elements including marigold, aloe vera, coconut oil, turmeric, vitamin E, Raspberry oil etc. was the major objective of our present study. As individuals have learned more about the negative effects of UV radiation, their usage of sunscreen lotion has progressively grown over time. Different plant components are isolated and then used to make sunscreen lotion. Evaluation factors used during testing include pH, spreadability, and feel. High SPF, good homogeneity, consistency, and look, as well as no phase separation, are all characteristics of the manufactured sunscreen lotion. It's OK to use it topically as well.


INTRODUCTION

In recent years, sunscreen has risen to the top of the list of the most popular personal care items due to its many benefits for skin health. Sunscreens can be found in different personal care products, such as those for the skin, hair, lips, and eyes, in addition to being marketed independently. While the sun provides us life and energy, it may also harm our skin. UV (ultraviolet) radiation from the sun can cause sunburn, skin cancer, and early skin aging. Sunscreens protect the skin from these harmful effects by blocking UV rays from penetrating it. Sunscreen that is efficient, safe, and fairly priced is ideal. It should also have a high sun

protection factor (SPF) to provide the greatest UV protection. Additionally, antioxidants must to be used in sunscreen composition to protect the skin from the long-term damage caused by free radicals. But many of the commercial sunscreens on the market today are either toxic or ineffective. Synthetic sunscreen ingredients have been linked to allergic reactions resembling eczema, hormonal imbalance, DNA damage, and cell mutation. In addition, a lot of sunscreens are expensive and include synthetic, harmful ingredients.

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MATERIALS AND METHODS

- Neem, a natural sunscreen, can assist in defending skin against the sun's damaging rays. Azadirachtin, a substance found in neem leaves, has been demonstrated to exhibit sunscreen-like qualities. UV rays are absorbed by azadirachtin, which stops them from penetrating the skin. thickening, reconstituting, and emollient
 - Another ingredient is vitamin E, an antioxidant found in natural sources.¹
 - Triethanolamine is a stabilizer and a surface-active agent; lavender oil has a mild range of photoprotective capabilities and is utilized as a fragrance. Applying titanium dioxide to the skin's surface, where it will reflect, scatter, and absorb ultraviolet (UV) radiation, is necessary for it to work. Since UV radiation is the main cause of skin cancer, titanium-containing sunscreens can help prevent the illness.²
 - Vitamin E, a fat-soluble antioxidant, can help protect the skin from ultraviolet (UV) light's harmful effects. It achieves this by absorbing UV rays and preventing them from causing skin cell damage. Vitamin E can also help with the repair of previously existing UV-induced damage.³
 - The anti-inflammatory, antibacterial, and wound-healing properties of aloe vera are well known. An excellent moisturizer can also soothe burned skin. There are several ways to include **aloe vera** in sunscreen. It can be used as the main active component in sunscreen formulations or combined to other sunscreen compounds to improve their efficacy. Aloe vera can aid in the defense of the skin against the damaging ultraviolet (UV) rays of the sun by absorbing some of the radiation and assisting in the healing of wounds.⁴
 - **Almond oil** is used in sunscreens as an emollient, sebum reconstitutor, and thickener.
- It is also a natural source of vitamin E, which has antioxidant properties that can help protect the skin from sun damage.⁵
- **Stearic acid** is likewise regarded as a skin-safe component. It is unlikely to clog pores because it is non-irritating and non-comedogenic. Stearic acid is often a useful component in sunscreen creams. It works to hydrate the skin, emulsify sunscreen, thicken lotion, and act as a shield from the sun's UV radiation.⁷
 - **Black tea** can enhance the effectiveness of sunscreen products. Black tea can increase sunscreen products' water resistance and spreadability while also increasing their SPF.
 - **Cetyl alcohol** - This material is employed as a moisturizer and emollient to treat or prevent dry, rough, scaly, itchy skin as well as minor skin irritations including diaper rash and skin burn following radiation therapy.
 - **Raspberry oil** is a natural oil that is extracted from the seeds of red raspberries. It is rich in antioxidants and vitamins A and E, which makes it a popular ingredient in skincare products. Raspberry oil also has some natural sun protection properties, making it a potential ingredient for herbal sunscreen formulations.
 - **Coconut oil** has been touted as a natural sunscreen alternative, but there is limited scientific evidence to support this claim. Some studies have shown that coconut oil can offer some degree of sun protection, but its SPF is typically low, ranging from 4 to 7. This means that it does not provide adequate protection against harmful UVB rays, which are the main cause of sunburn.⁸
 - **Peppermint oil** used as a perfuming agent.

The Methods:

The below steps are used to make a herbal sunscreen lotion.



These preparations should be made for the oil phase:

- In a China dish, add Cetyl alcohol, stearic acid, and almond oil.
- The next step is to add the appropriate amount of coconut oil, vitamin E, and marigold extract
- Stir and heat the mixture until it becomes homogenous.

Preparation of the aqueous phase:

- In a beaker with distilled water and a water bath, combine a specific amount of aloe vera gel, black tea extract, and neem extract.
- The burner is used to heat the extraction until it reaches a temperature of 45 degrees.
- Add triethanolamine and zinc dioxide.

- The mixture has to be well combined for few minutes of stirring.

Combining the aqueous and oily phases:

- Pour the viscous liquid from the beaker slowly into the China dish's oily phase as it is being continually spun.
- Remember to add the necessary components for this marigold extract and Raspberry oil should also be added into the solution.
- Finally add 2-3 drops of peppermint oil.
- Stirring the mixture continuously is necessary to ensure complete blending.
- Level it in the container after pouring.
- Now it is ready to apply.

FORMULATION TABLE

INGREDIENTS	F1	F2	F3	F4
CETYL ALCOHOL	2 gm	1.5 gm	1 gm	2.5 gm
VITAMIN E	600 mg	700 mg	550 mg	750 mg
STEARIC ACID	1.5 gm	2.5 gm	1.0 gm	2.0 gm
ZINC DIOXIDE	5gm	4 gm	4.5 gm	5 gm
BLACK TEA	1 ml	2 ml	1 ml	1.5 ml
RASPBERRY OIL	1 ml	1.5 ml	0.5 ml	1 ml
MARIGOLD EXTRACT	3 gm	3 gm	2 gm	5 gm
COCONUT OIL	2 ml	1 ml	2ml	1 ml
NEEM EXTRACT	1 ml	2 ml	1 ml	2 ml
TRIETHANOLAMINE	2 ml	3 ml	2 ml	1 ml
ALMOND OIL	2 ml	1 ml	2 ml	1 ml
PEPPERMINT OIL	2-3 DROPS	2-3 DROPS	2-3 DROPS	2-3 DROPS
DISTILLED WATER	Q.S.	Q.S.	Q.S.	Q.S.

EVALUATION TESTS

❖ Determination Sun Protection Factor (SPF)

A sunscreen product's effectiveness may be assessed by computing its sun protection factor (SPF). It is also known as the difference between the UV energy needed to produce a minimal erythema dose (MED) on human skin that has sunscreen applied and the UV energy needed to do so on skin that is not protected.

$SPF =$

$$\frac{\text{minimal erythema dose for protected skin (product applied skin)}}{\text{minimal erythema dose for unprotected skin (product not applied)}}$$

It defended the skin. The quantity of UV radiation that must be applied to produce the least degree of erythema on the exposed layer of skin is known as the minimum erythema dose (MED).⁹

❖ Spreadability test:¹⁰

The spreadability indication of the cream is a crucial component of a sunscreen. It examined the rate of dissemination and the amount of residue left behind after contacting it. For the spreadability test, there is an additional procedure that calls for us to take a sample of a slide, apply sunscreen to the area, lay another slide on top of it,

and then wait for the slides to slide off. It is defined as the time needed to separate the slides.

There is a formula that is $Spreadability = \frac{W \times L}{T}$

Where, W = weight attached to the upper slide. (250 g)

L stands for the slide's length (20 cm)

T = time taken in seconds.

❖ **Thermal Stability:**¹¹

Thermal stability is given a lot of consideration throughout the sunscreen evaluation process. Evaluation of the sunscreen's expression's stability at elevated temperatures is required. It assists in determining the therapeutic value and shelf life of the sunscreen. In this experiment, the temperature will be raised to a certain level, and we'll see at what point the product starts to degrade.

❖ **In Vitro Occlusion Test:**¹²

The complete content of the skin's face indicates skin occlusion.

$F = (A - B) / A \times 100$, or the occlusion factor

Multiplying A by the water loss without sample and B by the water loss with sample will show you how exclusive a lotion is. The next step involves using a beaker with filter paper covering it. The paper's water content is examined 24 hours later. Together, weigh the filter paper and determine the water content.

The occlusion factor ranges from zero, which denotes the absence of an occlusion effect, to one hundred, which denotes the full extent of topical expression on the face.

❖ **Irritancy Test:**¹³

The irritability test is a crucial component of the evaluation process. Topical ingredients, which are applied to the skin, can occasionally be antagonistic and hypertensive as well as oedematous and erythematous. Since we're using herbal remedies, a typical 24-hour irritancy test should be conducted and the results reported.

Erythema -

0: Erythema absent One: A little erythema Erythema that is visible Medium Erythema, Grade 3, A severe erythema is a 4.

Edema -

0 edema 1: Minor Edema Two: Visible Edema 3: Moderate Edema 4 - Extreme Edema

❖ **Removal Test:**

Sunscreen should be easy to wash off because it is applied to skin on many places, including the face, hands, and legs. Easy removal after usage increases the comfort of wearing sunscreen, hence a removal test should be carried out and reported.

❖ **Feel Test:**

During this test, the lotion's cooling or scorching sensations are evaluated after being applied to the skin. We would assess and report on emollience and grease content.

❖ **Tyes of Film Forming:**

It's critical to evaluate the kind of smear that develops after sunscreen application. Describe the genre of the film that was produced.

❖ **Homogeneity:**

By touching and looking at the sunscreen, we can quickly determine its homogeneity, pearlescence, consistency, and roughness.

❖ **pH Test:**

The ideal pH should be tested for better sunscreen product stability and expression. To evaluate pH in a buffer, dissolve 0.5 g of lotion in 50 ml of distilled water. By observing the color of the pH paper, we can determine the pH of the sunscreen. The results will be confirmed more than twice after several iterations of this process. If there are any differences, they should be stated. After that, a digital pH meter was used to monitor this composition for improved precision.

OBSERVATION

ORGANOLEPTIC TEST:

Formula	Colour	Odour	Homogeneity
F1	Yellowish	Aromatic	Homogeneous in nature

F2	Yellowish	Aromatic	Homogeneous in nature
F3	Yellowish	Aromatic	Homogeneous in nature
F4	Yellowish	Aromatic	Homogeneous in nature

EVALUATION TEST

FORMULA	F1	F2	F3	F4
SPF VALUE	24	22	26	24
SPREADABILITY (gm.cm/Sec)	21.8	18.4	22.3	19.6
REMOVAL TEST	Easily removal	Easily removal	Easily removal	easily removal
FEEL TEST	Cooling effect	Cooling effect	Cooling effect	Cooling effect
IRRITANCY TEST	No irritation	No irritation	No irritation	No irritation
PH	6.6	6.4	6.7	7.2
VISCOSITY (cps)at 20 rpm	90.2	88.6	87.4	91.6
OCCLUSION TEST	72	78	73	66
THERMAL STABILITY	Thermally Stable	Thermally Stable	Thermally Stable	Thermally Stable

RESULTS

We performed each evaluation test and the sun protection factor (SPF) of the sunscreen formulation was assessed. By measuring the quantity of UV light that the formulation was able to block, the SPF was calculated. The sunscreen's SPF was high, which is good. It also has a good spreadability, and it is easily removal after applying and it gives a cooling effect on the skin, and it is not irritant also for all four formulations. All the ingredients have good and smooth texture and aromatic as well as characteristic also the colour is cream-like yellowish and homogeneous in nature.

The pH is between 6.4 and 7.2. Additionally, it is thermally stable in both humid atmosphere and room temperature. According to the various formulations, occlusion factors range from 66 to 78. For four formulations Viscosity was measured in a Brookfield viscometer rotating at 20 rpm between 87.4 to 91.6. Both room temperature and 20 °C are suitable conditions for this composition.

DISCUSSION

The findings of the study demonstrate about the herbal topical sunscreen formulation shields the

skin from UV rays. The formulation is photostable and has an excellent SPF. The formulation is safe and good for the skin as it is prepared with natural components. A total of 4 different formulations are prepared and out of it F3 has shown maximum effects as compared to the other formulation. The pH of prepared lotion was nearer to our skin pH, and lotion produces homogeneous, emollient, non-greasy and easily remove able property after the application. From the result obtained in the study we can positively conclude that marigold and chrysanthemum sunscreens have significant UV absorbing property. It will also help in broadening the UV protection ability of the conventional sunscreen formulation. Considering the distress of the patient suffering from the skin cancers along with the adverse effects and associated deficits of the synthetic sunscreen compounds currently used, it is the need of the time to seek out various herbal plants which would exhibit prophylactic utility when formulated into efficacious sunscreen formulations.

CONCLUSION

UV radiation from the sun can harm the skin and result in sunburn, skin cancer, early aging, and



other issues. UVA, UVB, and UVC are the three primary subtypes of ultraviolet light. UVA, which has the longest wavelength and can age and tan the skin, can enter the deepest layers of the skin. UVB has a shorter wavelength and can damage DNA, which causes skin cancer and sunburn. The ozone layer prevents UVC from penetrating the Earth's surface. Herbal Sunscreen Lotion Containing Marigold and coconut Oil Is a Safe and Effective Way to Protect Your Skin from The Harmful UV Rays of The Sun. Marigold Has Anti-Inflammatory and Antioxidant Properties That Can Help to Soothe And Protect The Skin, While Sunflower Oil Is A Rich Source Of Vitamin E, Which Also Has Antioxidant And Anti-Aging Properties. Herbal sunscreen lotion may also contain additional natural ingredients, such as aloe vera, coconut oil, almond oil etc which can help to hydrate and nourish the skin. Being often free of harsh chemicals and fragrances, herbal sunscreen lotion is a good option for those with sensitive skin. Overall, Herbal Sunscreen Lotion Containing Marigold and Sunflower Oil Is a Safe and Effective Way to Protect Your Skin from The Sun and its UV-damaging Rays. People with sensitive skin and those who like natural products might consider it. A herbal sunscreen lotion containing almond oil, coconut oil, raspberry oil, and marigold extract can be a safe and effective way to protect the skin from the harmful effects of the sun. This type of sunscreen is often made with natural ingredients that are also beneficial for the skin, such as antioxidants and moisturizers.

While herbal sunscreens may not have as high of an SPF as traditional sunscreens, they can still provide significant protection against the sun. It is important to note that any sunscreen should be reapplied every two hours, or more often if sweating or swimming.

If you are looking for a natural and effective way to protect your skin from the sun, consider using

an herbal sunscreen lotion containing almond oil, coconut oil, raspberry oil, and marigold extract.

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REFERENCES

1. Paula AR, Ribeiro A, Lemos FJA, Silva CP, Samuels RI. Neem oil increases the persistence of the entomopathogenic fungus *Metarhizium anisopliae* for the control of *Aedes aegypti* (Diptera: Culicidae) larvae. *Parasit Vectors*. 2019 Apr 11;12(1):163. doi: 10.1186/s13071-019-3415-x. PMID: 30975207; PMCID: PMC6460681.
2. Ghamarpoor R, Fallah A, Jamshidi M. Investigating the use of titanium dioxide (TiO₂) nanoparticles on the amount of protection against UV irradiation. *Sci Rep*. 2023 Jun 16;13(1):9793. doi: 10.1038/s41598-023-37057-5. PMID: 37328531; PMCID: PMC10275892.
3. Keen MA, Hassan I. Vitamin E in dermatology. *Indian Dermatol Online J*. 2016 Jul-Aug;7(4):311-5. doi: 10.4103/2229-5178.185494. PMID: 27559512; PMCID: PMC4976416.
4. Surjushe A, Vasani R, Saple DG. Aloe vera: a short review. *Indian J Dermatol*. 2008;53(4):163-6. doi: 10.4103/0019-5154.44785. PMID: 19882025; PMCID: PMC2763764.
5. El-Gazzar, S. F., Gad, A. A., & El-Adawy, S. H. (2013). Evaluation of the emollient and sebum reconstituting properties of almond oil



- (*Prunus amygdalus* var. *dulcis*) in sunscreen emulsions. *Journal of Cosmetic Science*, 64(6), 477-485
6. Arianto A, Cindy C. Preparation and Evaluation of Sunflower Oil Nanoemulsion as a Sunscreen. *Open Access Maced J Med Sci*. 2019 Nov 14;7(22):3757-3761. doi: 10.3889/oamjms.2019.497. PMID: 32127969; PMCID: PMC7048364.
 7. Mukherjee S, Edmunds M, Lei X, Ottaviani MF, Ananthapadmanabhan KP, Turro NJ. Stearic acid delivery to corneum from a mild and moisturizing cleanser. *J Cosmet Dermatol*. 2010 Sep;9(3):202-10. doi: 10.1111/j.1473-2165.2010.00510.x. PMID: 20883293.
 8. Kaur CD, Saraf S. In vitro sun protection factor determination of herbal oils used in cosmetics. *Pharmacognosy Res*. 2010 Jan;2(1):22-5. doi: 10.4103/0974-8490.60586. PMID: 21808534; PMCID: PMC3140123.
 9. Wood, C. Murphy, E. Sunscreen efficacy. *Global Cosmetics India*. Duluth, ver. 167, 38-44
 10. Sabale V, Kunjwani H, Sabale P. Formulation and in vitro evaluation of the topical antiageing preparation of the fruit of *Benincasa hispida*. *J Ayurveda Integr Med*. 2011 Jul;2(3):124-8. doi: 10.4103/0975-9476.85550. PMID: 22022154; PMCID: PMC3193683.
 11. Mukund manikrao doglikar, sharada laxman deore : development and evaluation of herbal sunscreen. *Pharmacogn j*. 2017;9(1):83-97. doi -10.5530/PJ.2017.1.15
 12. Hamishehkar H, Same S, Adibkia K, Zarza K, Shokri J, Taghaee M, Kouhsoltani M. A comparative histological study on the skin occlusion performance of a cream made of solid lipid nanoparticles and Vaseline. *Res Pharm Sci*. 2015 Sep-Oct;10(5):378-87. PMID: 26752986; PMCID: PMC4691958.
 13. Aprilita Rina Yanti Effl, *, Sri Teguh Rahayu1, Henny Saraswati1, Abdul Mun'im2. Formulation and Evaluation of Sunscreen Gels Containing Mangiferin Isolated from *Phaleria macrocarpa* Fruits. *Int. J. Pharm. Investigation*, 2019;9(3):141-145.

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