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Phytochemical Screening and Evaluation of Hibiscus Rosa-Sinensis Linn. Flower.

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ABSTRACT: The objective of the current study is to assess the in vitro sun protection factor (SPF) of the gel formulation of Hibiscus Rosa-Sinensis Linn flower extract. Due to its antioxidant and photo-protective properties, Hibiscus Rosa-Sinensis Linn is a viable choice for inclusion in cosmetic and pharmaceutical formulations. To investigate the sun protection factors utilizing UV spectrophotometry, the study examines samples that have been exposed to UVB light. The in vitro sun protection factor of the Hibiscus Rosa-Sinensis Linn extract and its gel formulation are being tested, and the photo-stability of the isolated Hibiscus Rosa-Sinensis Linn extract and SPF are also being examined. According to the research, the gel of the Hibiscus Rosa-Sinensis Linn fruit extract is stable when kept between 5 and 25 degrees Celsius.[1]

I. INTRODUCTION:

Over a million people receive skin cancer diagnoses each year, and about 10,000 of those develop malignant melanoma. The backs of the hands, the neck, and other parts of the body that are frequently exposed to the sun are where most skin malignancies develop.[1]

Solar exposure according to its wavelengths, UV light is separated into three categories: UV-A, UV-B, and UV-C. UV-A's wavelength ranges from 400 to 320 nm, UV-Bs from 320 to 290 nm, and UV-Cs from 209 to 200 nm. Although the energy level of the light increases with shorter wavelengths and a lower number, increasing the amount of harm it might cause, this is detectable. Direct UV-C exposure would be harmful to the skin if it were sustained. Fortunately, air gases completely absorb UV-C before it reaches the ground. Longer UV-B and UV-A wavelengths always penetrate the atmosphere directly.

A skincare product called Hibiscus SPF Gel contains hibiscus extract and provides UV protection. The anti-inflammatory and antioxidant qualities of hibiscus extract are well known for helping to calm and shield the skin from damage brought on by environmental stressors. The gel's lightweight, non-greasy formulation makes it perfect for use as a daily moisturizer and sunscreen. It swiftly dissolves into the skin, providing a matte, silky texture that is ideal for use underneath makeup.Prolonged direct UV-C exposure may cause skin damage.

Longer wavelengths of UV-B and UV-A always pass through the atmosphere. The molecules in sunscreen absorb the majority of UV-B and prevent it from reaching the skin, much like the molecules in the atmosphere absorb UV-C and prevent it from reaching the ground.[3]

In the tropics, the glabrous shrub Hibiscus Rosa-Sinensis Linn (Malvaceae) is often grown as a decorative plant. It has many varieties and variously colored flowers. The China rose and shoe flower, sometimes known as the Chinese hibiscus, is an evergreen, blooming shrub that is indigenous to East Asia. Tropical regions and subtropics are often grown as ornamental plants. The original varieties' large, sturdy flowers are typically scarlet in color and lack any discernible scent most of the time. Numerous varieties, cultivars, and hybrids are available with a wide range of flower colors, including white, yellow, orange, red, pink-hued blooms, and flowers with both single and double sets of petals. However, in medicine, the red-flowered kind is favored.

Traditional writings claim that blooms are helpful in the treatment of arterial hypertension and have been demonstrated to drastically lower fertility. It is also widely known that Hibiscus Rosa-Sinensis leaves and flowers have anti-aging and hair-growth-promoting properties.

This plant which is indigenous to tropical and subtropical regions, is frequently cultivated for

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ornamental purposes. It produces large flowers in dense hedges. These enormous flowers frequently have a dark crimson color and are odorless. These beautiful blooms, which are grown across the Asian continent, are also known as China roses.

These large, scarlet blossoms are a favorite of hummingbirds, who frequently visit the gardens where they are planted. It's crucial to consider characteristics like vigor, appealing leaves, longevity, robust root systems, ease of maintenance, high flowering properties, etc. while breeding hibiscus plants. Today, a number of new types have been developed and established thanks to crossbreeding.

Along with the combination of qualities these new varieties possess, their popularity is growing. There are numerous cultivars and hybrids available, and these flowers have different hues and other traits. Well-known colors that have recently gained popularity include white, yellow, orange, red, and several shades of pink.

Identifying and learning more about flowers that have been used as sunscreen for a long time is the goal of our research, and is reported here on the potential of the Hibiscus Rosa-Sinensis flower extract, even though there are a number of aspects of the cosmetic formulation for which there is no prior data. The goals of this study are to evaluate the in vitro sun protection factor, photostability, SPF determination, UV irradiation, and fluorescence analysis of the isolated Hibiscus Rosa-Sinensis Linn flower extract.

A skincare product called Hibiscus SPF Gel contains hibiscus extract and provides UV protection. The anti-inflammatory and antioxidant qualities of hibiscus extract are well known for helping to calm and shield the skin from damage brought on by environmental stressors.

The gel's lightweight, non-greasy formulation makes it perfect for use as a daily moisturizer and sunscreen. It swiftly dissolves into the skin, providing a matte, silky texture that is ideal for use underneath makeup. If you want to shield your skin from the harmful effects of the sun in a natural and effective way, the Hibiscus SPF gel is a great option. All skin types, even sensitive skin, can use it, and it can be applied to the face and body.[1]

KEYWORDS:- Sun protection factor uv-protection uv light

II. COMPOSITION: -

The main ingredients of hibiscus gel:

1. Carbopol (Thickening agent)
2. Propylene glycol(moisturizer)
3. Methylparaben (Preservative)
4. Triethanolamine (Emulsifier)

III. OBJECTIVES:

Some specific objectives of using hibiscus SPF gel may include:

1. Protecting the skin from the sun's harmful UV rays: Hibiscus SPF gel contains ingredients that help shield the skin from both UVA and UVB rays.
2. Moisturizing and nourishing the skin: Hibiscus extract is known for its moisturizing properties, and using a gel that contains hibiscus can help keep the skin hydrated and healthy.
3. Preventing premature aging: Exposure to the sun's rays can cause premature aging of the skin, including wrinkles and fine lines. Using hibiscus SPF gel can help prevent these signs of aging.
4. Minimizing the risk of skin cancer: Regular use of sunscreen can help reduce the risk of developing skin cancer, and hibiscus SPF gel is a natural option that can provide this protection.

IV. MATERIALS AND METHOD:

Materials and extract preparation

The dried Hibiscus Rosa-Sinensis Linn flower was obtained from a local market in, Bengaluru. The petals of a flower are separated, cleaned by distilled water, and cut into small pieces. The petals were extracted with ethanol by maceration. The extracts were evaporated to dryness.[1]

V. FORMULATIONS:

For gel formulation containing Hibiscus Rosa-Sinensis Linn flower extract with a final

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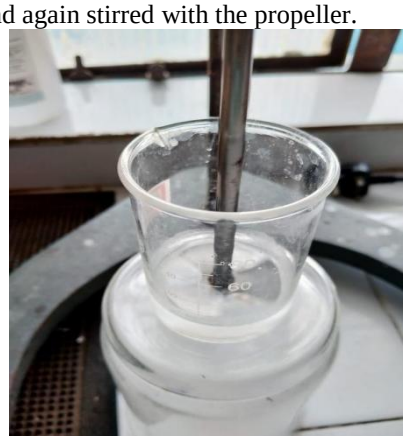
concentration of 1% of Carbopol 940 was prepared. The formulated product is stored in a dark glass flask and is freshly prepared for all studies.
A formulation was prepared with the addition of active ingredient which is shown in Table 1.

1. Hibiscus dried flower 3. Powdered flower Extract
2. Powdered flower 4. Extract on drying.

Table 1. Composition of gel formulations used for the determination of SPF [100ml]

Active ingredient	Quantity
● Carbopol 940	1gm
● Propylene glycol	1ml
● triethanolamine	2ml
● Methyl paraben	0.3gm
● Hibiscus Rosa-Sinensis petal extract	0.4gm
● Distilled water.	q. s

1. **Preparation of Carbopol gel base:** A weighed amount of Glycerin was added to distilled water and stirred with a propeller for incorporation of Glycerin in water. A weighed amount of Carbopol 934 was added slowly to the mixture of water and glycerin and continuously stirred with the propeller for 1 hr. Preservatives were also added to the gel base and again stirred with the propeller.



Mixture of ingredients in Propeller

2. **Preparation of gel formulation**: A final mixture of propylene glycol, Methylparaben, and q.s of distilled water was added to the Carbopol gel base, then perfume was added, and pH was adjusted with Triethanolamine.[1]

Final Preparation

1. **Phytochemical screening of Hibiscus Rosa Sinensis L flower ethanol extracts:** [4]The petals of a flower are separated, cleaned by distilled water, and cut into small pieces. The petals were extracted with ethanol by maceration. The extracts were evaporated to dryness and the obtained extract is evaluated for presence of phytochemical.

Table 2: Phytochemical screening

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Chemical constituents	Tests	Flower extract
1. Alkaloids	Wagner test	+
	Hager test	+
	Dragendorff`s test	+
2. Carbohydrates	Fehling`s test	-
	Barfoed`s test	-
	Molisch test	-
3. Triterpenoids	Salkowski test	+
	Liebermann test	+
4. Coumarins	10% NAOH	+
5. Steroids	Liebermann test	+
6. Tannins	5% Fecl3	+
7. Saponins	Water	-
8. Flavones	Schinoda test	+
9. Chalcones	Conc. HNO3& H2SO4	-
	Aceti acid conc. c & H2S O4	-
10. Amino acids	Ninhydrin	-
11. Glycosides	Keller kiliani test	-
	Anthraquinone test	-
12. Proteins	Biuret test	-
	Million`s test	-
	Xanthoprotein test	-

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13. Phenols	10% Fecl3	-
	Dil HNO3	-

VI. EVALUATION OF SUNSCREEN GEL: -

1. Organoleptic parameters: -

In organoleptic parameters such as appearance, color, odor, transparency, and smoothness of formulation were studied.

2. pH determination: -

pH measurement is measured by a digital PH meter with a magnetic stirrer. The pH of the gel should be neutral for better absorption in the skin. In this method, the electrode was washed with double distilled water, dried with the help of tissue paper, and then dipped in 30 gm of gel formulation. The pH of the gel formulation is recorded at ambient condition.

3. Determination of the in vitro sun protection factor: -

The in vitro method measures the reduction of irradiation by measuring transmittance after passing through a film of product. As the operative conditions of the transmission measurement are correct, this is to be a very precise and single value, always reproducible for the same product and expressed as a single UV curve, in the percent transmittance or absorbance scale. The gel formulation (1.5% carbomer 937) contains Hibiscus Rosa-Sinensis Linn. The extract was analyzed for the in vitro SPF. The crude Hibiscus Rosa-Sinensis Linn. extract gel formulation was dissolved in methanol UV Sol: water (1:1). Scans of the samples in solution were run from 320 to 290 nm in a Shimadzu UV-1700 spectrophotometer. The commercial sunscreens, Himalaya SPF 30, were used for the calculation of the correction factor, and a solution of 8% homosalate (v/v) diluted to 0.2 mg/ml was used as standard The following equation, suggested by Mansur, served as the foundation for the SPF model employed in this investigation.

SPF=CF×$\sum_{290}^{320}$ $EE(\lambda)\, I(\lambda)$**×abs(λ)**

where CF is the correction factor, determined by sunscreens with known SPF so that a solution containing 8% of homosalate gives SPF ¼ 8; EE the erythemal efficiency spectrum; I the solar simulator spectrum as determined by a spectroradiometer that has been calibrated.

$\sum_{290}^{320}$ $EE(\lambda)\, I(\lambda)$= **290 − 320**

where, 290-320 nm in 5 nm increments; abs(λ) is the spectroradiometer measure of sunscreen product absorbance.[3]

Table 3: Determination of the in vitro sun protection factor

Sl.no	wavelength	EE×I	Absorbance	Dilution factor	Correction factor	Sun protection factor
1	**290**	**0.015**	**0.41**	**10**	**10**	**0.165**
2	**295**	**0.0187**	**0.26**	**10**	**10**	**0.4862**
3	**300**	**0.2874**	**0.17**	**10**	**10**	**4.8858**
4	**305**	**0.3278**	**0.15**	**10**	**10**	**4.917**
5	**310**	**0.1864**	**0.15**	**10**	**10**	**2.796**

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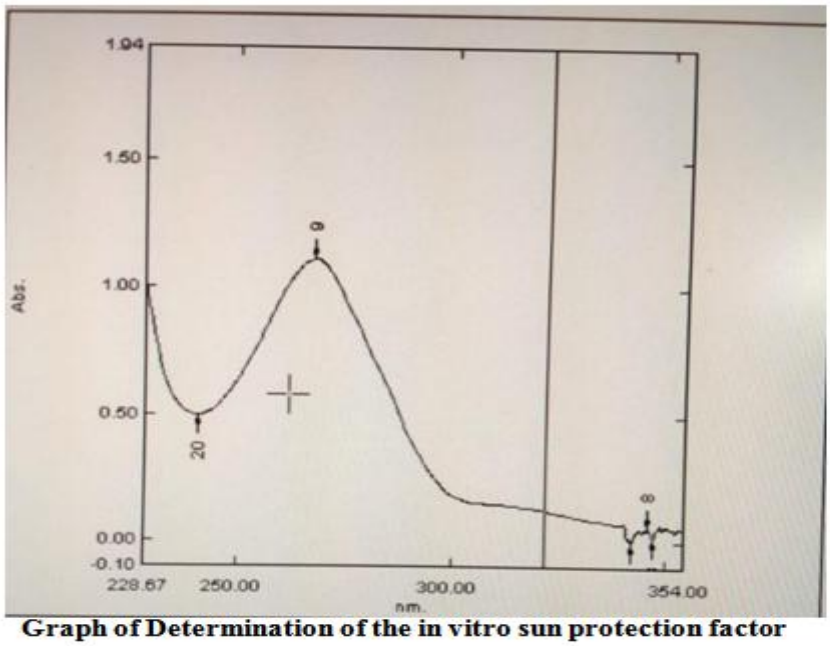
6	**315**	**0.0839**	**0.14**	**10**	**10**	**1.1746**
7	**320**	**0.018**	**0.13**	**10**	**10**	**0.234**
						15.1086



Graph of Determination of the in vitro sun protection factor

λmax=267.6
Abs=1.12

Table 4: - Graph of Determination of the in vitro sun protection factor

Wavelength	Absorbance
290	0.41
295	0.26
300	0.17
305	0.15
310	0.15
315	0.14
320	0.13

4. Determination of Rheological Study/ Viscosity: -

The produced gel was put into the sample cell in the designated volume and gently inserted into the adaptor. The guard leg was put around the adaptor, and a stirring element with a motor was used to slowly mix the sample volume. The display window was used to record the viscosity values.

1. Type of equipment – Brookfield viscometer with small sample volume adaptor spindle

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(S63)

2. Sample volume –50 gm
3. The speed of rotation of the stirring element is 10-100 rpm.

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Table 5: Determination of Rheological Study/ Viscosity

RPM	CP	%TORQUE	STD VALUE
10	4360	36.3	1200
20	3317	55.3	5999
30	2467	61.7	3999
50	1831	76.3	2399
60	1536	76.8	2000
100	1056	88	1200

5. Determination of Fluorescence analysis of powders & extracts

Dried powder and extracts of the leaves were tested for their characteristic colors and fluoresced both under visible(short) and ultraviolet (long, UV 365nm) lights after treatment with chemical solvents including alkalis and acids.[4]

Table 6: Determination of Fluorescence analysis of powders.

Reagents + Powder	Daylight	Short wavelength	Long wavelength
Flower powder	Green	Green	Greenish brown
Powder + water	Green	Reddish brown	Dark brown
Powder + Ethanol	Red	Dark red	Dark brown
Powder +dil HCl	Dark pink	Peach	Brownish pink
Powder +dil.H2SO4	Red	Red	Brown
Powder +dil. HNo3	Red	Red	Dark red
Powder +dil. NaoH	Blackish green	Blackish green	Dark brown
Powder + alc. NaoH	Greenish brown	Greenish brown	Brown
Powder +aq.KOH	Greenish brown	Greenish black	Black
Powder +alc.KOH	Light green	Light green	Brownish black

6. Determination of UV irradiation

0.25 grams of prepared hibiscus gel is exposed to UV radiation for about 1hr. The exposed sample is subjected to dilution using methanol and water as solvent. The crude Hibiscus Rosa-Sinensis Linn. Extract gel formulation was dissolved in methanol UV Sol: water (1:1). Scans of the samples in solution were run from 320 to 290 nm using 1 cm quartz cuvettes in a Shimadzu UV-1700 spectrophotometer.[8]

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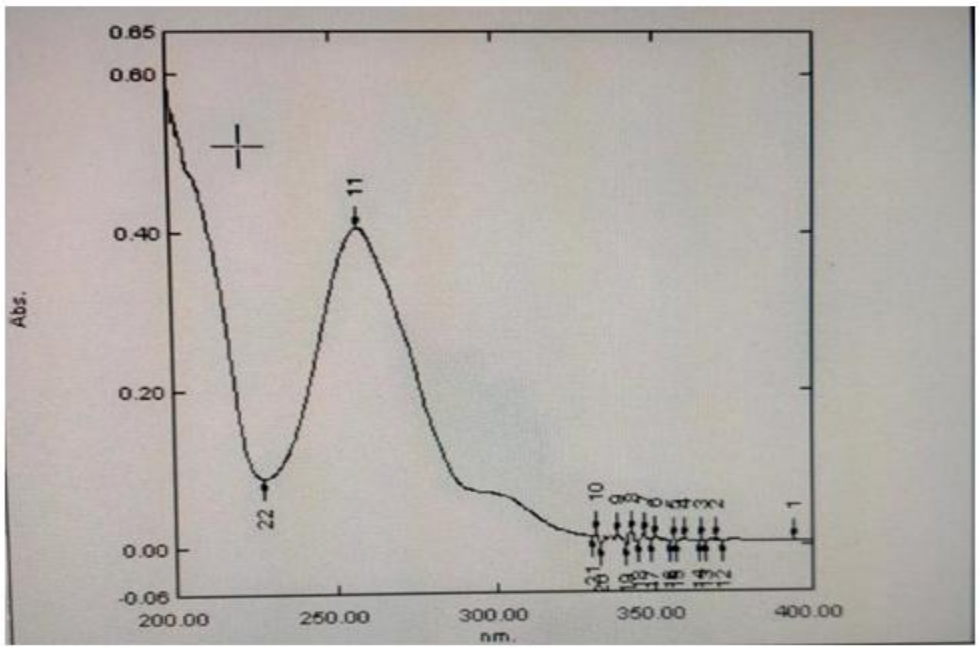

Graph of Determination of UV irradiation

Table 7: Graph of Determination of UV irradiation

wavelength	Absorbance
290	0.07
295	0.07
300	0.07
305	0.06
310	0.04
315	0.03
320	0.02

Evaluation parameters:

1. Organoleptic parameter:

1. Appearance : Jelly
2. Colour : Light Pink
3. Odour : Jasmine
4. Transparency : Opaque
5. Smoothness : Smooth
6. pH : Neutral

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VII. RESULTS

1. The Phytochemical screening

Results of the Phytochemical screening of flower have been tabulated in **Table 2**

2. The sun protection factor

Results of the sun protection factor for the formulation of gel have been tabulated in **Tables 3 & 4.**

3. The Rheological study

Results of the Rheological study for the formulation of gel have been tabulated in **Table 5.**

4. The Fluorescence analysis

The fluorescence analysis of the powder and extracts of **Hibiscus Rosa-Sinensis Linn** in various solvents and chemical reagents under visible(short) and ultraviolet (long, UV 365nm) lights and normal day light is given in **Table 6.**

5. The UV Irradiation analysis

Results of UV Irradiation analysis for the formulation of gel have been tabulated in **Table 7.**

VIII. CONCLUSION

The findings showed that the plants under study had components that are significant for use in medicine. The presence of these phytochemicals may contribute medicinal as well as physiological properties to the plants studied in the treatment of sun protection. Therefore, extracts from these plants could be seen as a good source of useful drugs.

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