



FORMULATION AND EVALUATION OF CREME SOLAIRE BY USING POLY VERDANTS

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ABSTRACT

The federal Food and Drug Cosmetic Act defines cosmetics by their intended use as articles intended to be rubbed, poured, sprinkled or sprayed on, introduced into, or otherwise applied to the human body for cleansing, beautifying, promoting attractiveness, or altering the appearance.

Sunscreen agents are used for external use only. The use of sunscreen as photo protecting agents for UV protection. The sunscreen formulation is which when applied topically to protect the skin from harmful UV radiation.

The present research work was to formulation and evaluation of Creme Solaire by using Poly Verdants. The herbal sunscreen was prepared by using extracts of Beetroot, Pomegranate and Banana leaf.

The prepared formulation was evaluated for various parameters like pH, SPF, Viscosity, Spreadability and Removal. The different formulation were prepared and evaluated among which shows best result.

Key words: Herbal Sunscreen, Skin, Beetroot, Pomegranate, Banana leaf, SPF.

INTRODUCTION

Herbal Sunscreen are agents which reflect, absorb and scatter both ultraviolet A and B radiations to provide protection against both type of radiation. Excessive solar ultraviolet radiation are responsible for various skin damages such as sunburn, skin pigmentation, premature aging and photo

carcinogenesis. Sunscreen should contain antioxidant agent in addition to sun block agent to be effective in prevention of photo aging and skin cancer.^[4]

Several herbs is used in the cosmetics for beautification and restoring normal skin appearance by maintaining normal skin function, delivering vital nutrients to the skin, and avoiding adverse effects of external stimuli on the body. The demand of herbal cosmetics is increasing rapidly due to their skin friendliness and lack of side effects. The use of herbal elements in sunscreen provide least irritation to the skin, especially for sensitive skin and also it regenerate the skin and give enough protection against pollution and climate changes in the atmosphere.

Advantages of herbal sunscreen

- No side effects.
- Suitable for all skin types.
- They are inexpensive.
- Easy procedure, does not need any special equipments.
- Botanical ingredients are easily available.

The present study attempts to develop sunscreen cream from the extracts of Beta Vulgaris, Punica Granatum and Musa Acuminata. The effectiveness of the products were evaluated through various physicochemical properties and biological activities.

Anthocyanin is extracted from Beta Vulgaris and Punica Granatum. Anthocyanin belongs to a parent class of molecules called flavonoids. They occur in all tissues of higher plants including leaves, stems, fruits, roots, flowers. It is a water soluble pigments in the plants and it provide the antioxidant activity. Depending on their pH, it may appear as red, purple, blue or black. Various source of anthocyanin are pomegranate, beetroot, grapes, red cabbage etc. Herbal sunscreen which made up of anthocyanin it may be cream, lotion or other topical product which provide protection to the skin against sunburn.^[2]

Lignin is extracted from Musa Acuminata. Lignin is a class of complex organic polymers that form important structural materials in the support tissues of vascular plants and some algae. Lignin are particularly important in the formation of cell wall, because they lend rigidity and do not rot easily. Chemically lignin are cross linked phenolic polymers. Since, lignin is natural active as a sun screening agent. Various sources of lignin including green coffee, soya and papaya as well as banana leaves. Banana leaves will be selected as a source of lignin because banana leaves are reported as high level of lignin.^[5]

Mechanism of action

The mechanism of action of various sunscreens can be understood by the type of molecule incorporated into the formulation. Inorganic agents act by scattering the micro particles in the upper skin layers which may enhance the efficiency of the sunscreen compound thereby increasing the sun protection factor. The use of certain sunscreens causes a reduction in the generation of free radicals in the skin due to its antioxidant activity.

Organic molecules, on the other hand, absorb the radiations instead of scattering them. Thus, this distinct feature makes them the target for degradation in the presence of sunlight and therefore these molecules can lead to the generation of free radicals. Organic sunscreens also have the ability to cause photo-irritation and photosensitizing reactions. Inorganic molecules also have certain disadvantages due to their dispersion nature of the molecules which require an additional requirement of surface coating the molecule. This, in turn, reduces the photoreaction of the molecules upon exposure to UVR thus free radical generation does not take place.^[4]

MATERIALS AND METHODS

MATERIALS

Excipients	Supplier
Stearic acid	Chemodyes corporation Rajkot, India
Liquid paraffin	Chemodyes corporation Rajkot, India
Glycerin	Chemodyes corporation Rajkot, India
Cetyl alcohol	Chemodyes corporation Rajkot, India
Methyl paraben	Chemodyes corporation Rajkot, India
Propylene glycol	Chemodyes corporation Rajkot, India
Beeswax	Chemodyes corporation Rajkot, India
Triethanolamine	Chemodyes corporation Rajkot, India

Table no: 1 Excipients used

METHODS

Extraction of Anthocyanin from Punica Granatum

Anthocyanin is extracted from fresh fruit of pomegranate by placed in a ethanol which containing 0.1%v/v HCl in beaker. The lid of the beaker is close with aluminium foil and placed in a dark room for 24 hrs at room temperature. After 24 hrs the filtration is carried out using muslin cloth. Then filtrate is evaporated on steam bath at 40°C.^[6]



Fig no:1 Maceration Process



Fig no: 2 Filtration

Extraction of Anthocyanin from Beta Vulgaris

Anthocyanin is extracted from fresh taproot portion of beetroot. 50 gm of chopped beetroot is placed in a beaker containing water and 0.1% v/v HCl. The lid of the beaker is closed with aluminium foil and placed in a dark room for 24 hrs at room temperature. After 24 hrs filtration is carried out by using muslin cloth. The filtrate is evaporated on a steam bath at 40°C. [6]



Fig no: 3 Maceration Process



Fig no: 4 Filtration

Confirmatory test for Anthocyanin

- 1 ml of *Punica granatum* extract was mixed with 2M HCl and heated for 5 min at 100°C When the extract remains the stable purple color confirms the presence of anthocyanin.
- 1ml of *Punica granatum* extract mixed with 2M NaOH and the formation of green color indicates the presence of anthocyanin.
- 1 ml of *Beta vulgaris* extract mixed with 2ml of 2M NaOH and formation of yellow color indicates the presence of anthocyanin.

Extraction of Lignin from Musa Accuminata

Lignin is extracted from fresh leaves of banana. 60g of banana leaves are collected and placed in round bottom flask and add 150ml distilled water and 150ml ethanol then reflux for 3hr. after 3hr filtration carried out. Filtrate is collected.^[5]



Fig no: 5 Reflux

Confirmatory test for Lignin

- 1ml of *Musa acuminata* extract mixed with 1 drop of saffranine dye and formation of red color indicates the presence of lignin.^[5]

Preparation of Sunscreen Cream

- For sunscreen cream preparation punica granatum extract, beta vulgaris extract, musa acuminata extracts was used as active ingredient.
- Calculated amount of beeswax, stearic acid, liquid paraffin, cetyl alcohol was accurately weighed and transferred to a thoroughly cleaned china dish and melted at 80°C, which is considered as oil phase.
- Taken anthocyanin extracts and lignin extract in a beaker containing glycerin, methyl paraben, propylene glycol, water and heated up to 80°C, which is considered as aqueous phase.

- When both acquired same temperature, aqueous phase was added to the oil phase by continuous stirring.
- When temperature was dropped to 40°C triethanolamine and perfume was added to it.
- After getting required consistency, the formulation was packed in a cleaned container.

Ingredients	F1	F2	F3	F4	F5
Anthocyanin from Punica Granatum	2	3	2	3	2
Anthocyanin from Beta Vulgaris	2	3	2	3	3
Lignin from Musa Acuminata	3	3	2	2	2
Stearic acid	3	3	3	3	3
Beeswax	3	3	3	3	3
Liquid paraffin	5	5	5	5	5
Glycerin	8	8	8	8	8
Cetyl alcohol	0.5	0.5	0.5	0.5	0.5
Propyl paraben	0.08	0.08	0.08	0.08	0.08
Propylene glycol	3	3	3	3	3
Triethanolamine	0.2	0.2	0.2	0.2	0.2
Water	qs	qs	qs	qs	qs
Perfume	qs	qs	qs	qs	qs

Table no: 2 Formulation ingredients

F1**F2****F3**

F4**F5**

Evaluation of Prepared Formulation

Physical evaluation

The herbal sunscreen cream were inspected for their color, odour, homogeneity and grittiness.

Homogeneity and grittiness

A small quantity of sunscreen cream was pressed between the thumb and the index finger. The consistency of cream was noted (whether homogeneous or not), if there were any coarse particles appeared on fingers. Also, the homogeneity could be detected when a small quantity of sunscreen cream was rubbed on the skin of the back of the hand. The grittiness of sunscreen cream also observed in this manner.

Measurement of pH

pH is one of the most important parameters involved in the topical formulation. The two area of critical importance are the effect of pH on solubility and stability. The topical preparation should be non-irritant to skin. To ensure that the preparation has same pH as that of skin the pH of the prepared herbal sunscreen cream after the addition of all ingredients was measured using calibrated pH meter.

About g of sunscreen cream accurately weighed and dissolved in 100ml distilled water. The pH of the dispersion was measured using digital pH meter. The measurement of pH were done in triplicate and the average values were calculated.

Viscosity measurement

Viscosity of formulated cream was determined by using Brookfield viscometer. The Cream were rotated at 25 rpm using spindle no.64. At each speed, the reading was recorded. The viscosity determination of samples was repeated three times.

Spreadability

Two sets of glass slides of standard dimensions were taken. The herbal sunscreen formulation (2g) was placed over one of the slides. The other slide was placed on the top of the cream such that the cream was sandwiched between the two slides in the area occupied by a distance of 7.5 cm along the slide. A 20g weight was placed upon the upper slides so that the cream between the two slides was pressed uniformly to form a thin layer. The weight was removed and the excess of gel adhering to the slides were scrapped off. The two slides in position were fixed to a stand without slightest disturbance and in such a way that only the upper slide to slip off freely by the force of weight tied to it. A 20g weight was tied to the upper slide carefully. The time taken for the upper slide to travel the distance of 7.5 cm and the separated away from the lower slide under the influence of the weight was noted. The experiment was repeated by three times and the mean time taken for calculation. Spreadability was calculated by using the following formula:

$$S = M \times L \div T$$

Where,

S= Spreadability

M= Weight tied to the upper slide (20g)

L= Length of the glass slide (7.5cm)

T= Time taken in seconds

Sun Protection Factor (SPF)

Dissolve 0.050g of herbal sunscreen in a 50 ml ethanol. Between 290-320nm SPF was calculated using the equation:

$$SPF = CF \sum EC(\lambda) \times A(\lambda)$$

Where;

CF= correction factor

EE= Erythemogenic effect

I= intensity of solar light of wavelength

A= absorbance

After feel

Emolliency, slipperiness and amount of residue left after the application of fixed amount of cream was checked.

Removal

The ease of removal of the cream applied was examined by washing the applied part with tap water.

Results and Discussion

Physical evaluation

We have physically evaluated the prepared formulation which include colour, odour and the results are as follow it is found that, the cream of all batches had desirable physical properties.

SL.NO	Formulation code	Colour	Odour
1	F1	Pink	Characteristic
2	F2	Pink	Characteristic
3	F3	Pale Pink	Characteristic
4	F4	Pinkish red	Characteristic
5	F5	Pink	Characteristic

Table no:3 Physical evaluation of herbal sunscreen

pH Determination

As per included the methods discussed in 4.4.3, the pH determination was conducted. The pH value of all prepared formulation was found to be in the range of which was considered to be acceptable to avoid the risk of irritation upon application to the skin.

Sl. No	Formulation code	pH
1	F1	7.23
2	F2	6.44
3	F3	6.50
4	F4	6.40
5	F5	6.19

Table no: 4 pH of herbal sunscreen

Determination of viscosity

The viscosity of the cream was in the rang , which indicates that the cream is easily spreadable by small amount of shear were shown in the table.

RPM	Spindle	Viscosity(cps)
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20	64	29656
20	64	28320
20	64	29436
20	64	29709
20	64	27906

Table no:5 Viscosity of herbal sunscreen

Spreadability

The spreadability were conducted. Spreadability of sunscreen cream were found in the range of

SL. NO	Formulation code	Spreadability(g/cm/sec)
1	F1	18.75
2	F2	18.75
3	F3	21.4
4	F4	21.4
5	F5	21.4

Table no : 6 Spreadability of herbal sunscreen

Sun protection factor (SPF)

SPF is a measure of how effective sunscreen are at preventing sunburn. The SPF of herbal sunscreen are with in the range of

SL.NO	Formulation code	SPF
1	F1	14.71
2	F2	6.45
3	F3	9.32
4	F4	18.65
5	F5	15.98

Table no:7 Sun protection factor

Removal

Cream when applied on skin was easily removed using tap water.

Appearance

When formulation was kept for long time, it found that no colour change.

OPTIMIZED FORMULATION

Formulation Of Optimized Product

- For sunscreen cream preparation *Punica Granatum* extract, *Beta Vulgaris* extract, *Musa Acuminata* extracts was used as active ingredient in the ratio 3:3:2.

- Calculated amount of beeswax, stearic acid, liquid paraffin, cetyl alcohol was accurately weighed and transferred to a thoroughly cleaned china dish and melted at 80°C which is considered as oil phase.
- Taken anthocyanin extracts and lignin extract in a beaker containing glycerin, methyl paraben, propylene glycol, water and heated up to 80°C which is considered as aqueous phase.
- When both acquired same temperature, aqueous phase was added to the oil phase by continuous stirring.
- When temperature was dropped to 40°C triethanolamine and perfume was added to it.
- After getting required consistency, the formulation was packed in a cleaned container.

OPTIMIZED FORMULATION



Evaluation Parameters of Optimized Product

Evaluation		F4 (Optimized product)
Physical Evaluation	Colour	Pinkish red
	Odour	Characteristic
pH		6.45
Viscosity		29704
Spreadability		21.1
Sun Protection Factor (SPF)		18.25

Conclusion

In our research work, an attempt was made to formulate herbal sunscreen by using Anthocyanin and Lignin extracts. Anthocyanin and Lignin have antioxidant property. This formulation was prepared by using maceration method. Anthocyanin was extracted from Punica granatum and Beta vulgaris and

lignin was extracted From Musa acuminata Formulation consist of beeswax, stearic acid, cetylalcohol, propylen glycol, glycerin, methyl parben, liquid paraben, triethanolamine, anthocyanin and lignin extracts. In which orange oil is used as flavouring agent. All the prepared formulation were evaluated for viscosity, pH, spreadability, irritancy, SPF. Among all these five formulation, F4 shown better consistency, viscosity, pH, spreadability, SPF and absence of irritancy, Hence F4 is the optimized formulation. F4 is used for the further studies.

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