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FORMULATION AND EVALUATION OF TOPICAL FORMUTATION OF Gmelina arborea WITH ANTIOXIDANT ACTIVITY

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Abstract: Oxidative stress caused by free radicals plays a major role in skin aging and damage. Natural antioxidants from plant sources are increasingly preferred for topical formulation due to their safety and efficacy. The present study aimed to formulate and evaluate a topical cream containing Gmelina arborea extract for antioxidant activity. The methanolic extract of G. arborea was prepared using Maceration extraction and evaluated for free radical scavenging activity using H_2O_2 Scavenging assay. Based on antioxidant potential, the extract was incorporated into cream formulations using different emulsifying agents. The formulations were evaluated for physicochemical oarameters such as pH, spreadability, homogeneity, stability, and antioxidant activitiy, suggesting its potential use in herbal applications.

Keywords: - Gmelina arborea, Antioxidant, Evaluation, H_2O_2 Scavenging assay

I. INTRODUCTION

Skin exposure to environmental factors such as UV radiation leads to the generation of reactive oxygen species (ROS), witch accelerate aging and skin damage, Antioxidants neutralize free radicals and protect skin integrity. Gmelina arborea (family: Lamiaceae/Verbenaceae) is a medicinal plant known for its anti-inflammatory, antimicrobial, and antioxidant properties. It contains flavonoids, phenolics, and lignans responsible for free radical scavenging activity. Inspired by previous work on herbal antioxidant creams, this study focuses on developing a topical antioxidant formulation using G. arborea extract.

Fig. Gmelina arborea plant

MATERIAL AND METHOD

Extraction of Gmelina arborea Leaves (Maceration Method)

Dried powdered leaves (50 g) were accurately weighed and transferred into a clean conical flask. Ethanol (200–300 ml) was added to completely immerse the drug. The flask was tightly closed and kept at room temperature for 72 hours with intermittent shaking to ensure proper extraction. After maceration, the extract was filtered using muslin cloth followed by filter paper.

Preformulation Studies

1. Extractive Values

A) Water Soluble Extractive Value

5 g of air-dried powder was macerated with 100 ml chloroform water for 24 hours with frequent shaking. The filtrate (25 ml) was evaporated to dryness and dried at 105°C.

Result: 36% w/w

B) Alcohol Soluble Extractive Value

5 g of powder was macerated with 100 ml ethanol for 24 hours, filtered, and 25 ml filtrate was evaporated and dried at 105°C.

Result: 48% w/w

2. Ash Values

A) Total Ash Value

2 g of powdered drug was incinerated at ≤450°C until carbon-free ash was obtained.

Result: 10% w/w

B) Water Soluble Ash Value

Total ash was boiled with water, filtered, and insoluble residue removed.

Result: 7.5% w/w

3. Moisture Content

2 g of powdered drug was dried at 105°C until constant weight.

Result: 15%

Formulation of Antioxidant cream

S.NO.	Ingredients	F1	F2	F3
1.	Gmelina extract	1 g	1 g	1g
2.	Cetyl alcohol	1 g	1.25 g	1.5 g
3.	Stearic acid	4 g	4.5 g	5 g
4.	Liquid paraffin	5 ml	5.5 ml	6 ml
5.	Glycerin	2 ml	2.5 ml	2.5 ml
6.	Triethanolamine	0.3 ml	0.4 ml	0.5 ml
7.	Methy paraben	0.08 g	0.09 g	0.1 g
8.	Propyl paraben	0.02 g	0.022 g	0.025 g

Formulation of cream:-

Accurately weighed cetyl alcohol, stearic acid, and liquid paraffin were taken in a clean beaker. The mixture was heated on a water bath at 70-75°C until all the ingredients melted completely. In another beaker, distilled water was taken and heated to the same temperature (70- 75°C).Glycerin, methyl paraben, and propyl paraben were added and dissolved properly. Triethanolamine was then added to the aqueous phase with continuous stirring. The hot Aqueous Phase was slowly added to the oil phase with continuous stirring. Stirring was continued to form a smooth and uniform emulsion and the mixture was allowed to cool to about 40°C. Gmelina arborea extract was added gradually with constant stirring to ensure uniform distribution. Proper mixing was done to obtain a smooth and homogeneous cream.

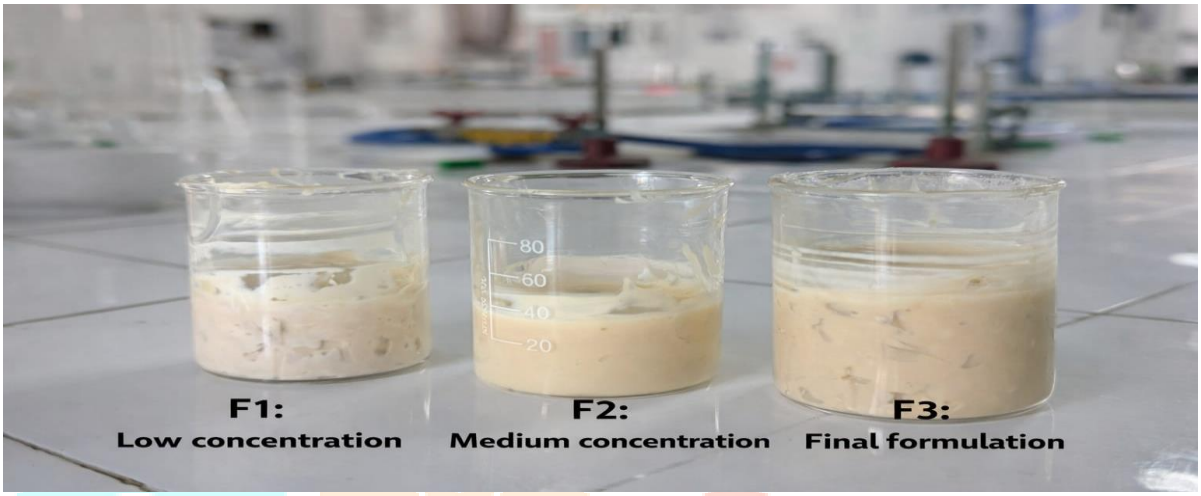


Figure1.2 Formulated cream

Evaluation Test:-

1. **Biochemical test: -** The biochemical tests were applied for flavonoids, Phenolic compounds and iridoids.

a) **Flavonoids: -** Alkaline reagent test was used in which 1ml of extract was mixed with two to three drops of NaOH and HCL was added drop wise.

Yellow colour was observed hence flavonoid was present.

b) **Phenolic compound: -** Ferric chloride test was used in which 1 ml of extract was mixed with two to three drops of 5% FeCL3.

Blue-green colour was observed hence phenolic compound was present.

c) **Iridoids: -** Trim hill test was performed 1 ml of extract was mixed with acetic acid and 1% CuSO4 and heat was provided.

Reddish colour observed hence iridoid glycoside was present.

2. Organoleptic evaluation:-

The colour of the cream is found to be beige-creamish colour, the odor is mild characteristic herbal odour the appearance is smooth and the texture is thick semi solid.

3. Spreadability test:-

The Spreadability test for the antioxidant cream used to check ability to evenly distribute and cover a given surface area upon application

The Spreadability of the cream was found 20 g.cm/sec

4. pH test:-

The pH of all formulation was found to be within acceptable skin friendly range 6-7

5. Viscosity:-

The viscosity was observed using Brookfield viscometer by using the spindle 74 and at 12rpm

The viscosity was found to be 10790 mPas

6. Stability test:-

Stability study showed no significant change in appearance order or phase separation throughout the 30 days indicating good physical stability of the formulation. The overall the formulation remains stable under the tested conditions confirming its suitability for the topical use

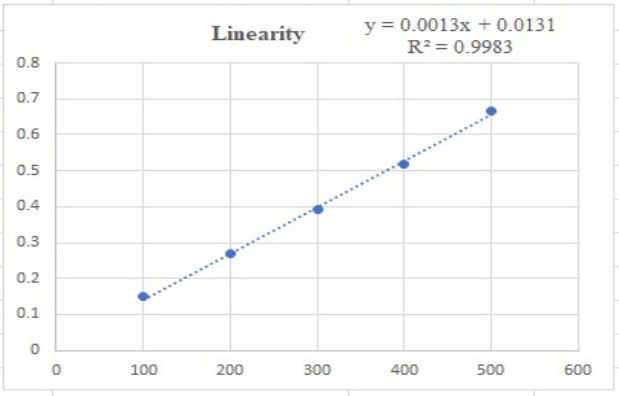
Antioxidant Assay:-

The antioxidant potential of the formulated cream was evaluated using the H2O2 scavenging assay**.** Hydrogen peroxide (H_2O_2) is a weak oxidizing agent that can generate hydroxyl radicals (•OH), which are highly reactive and toxic to cells. Antioxidants can scavenge H_2O_2 by converting it into water (H_2O), thereby reducing oxidative damage.

The decrease in absorbance of H_2O_2 at 230 nm is measured spectrophotometrically in the presence of the sample.

Sr.No.	X scale	Y scale
	Concentration	Response
1	100	0.149
2	200	0.268
3	300	0.393
4	400	0.519
5	500	0.667
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Slope:	0.001287
Intercept:	0.0131
Residual sum of squares:	0.009727967
r^2:	0.998288943
Correlation Coefficient (r):	0.999144105



% Scavenging Activity

Concentration (µg/ml)	Absorbance	% Scavenging Activity
100	0.149	77.66%
200	0.268	59.82%
300	0.393	41.08%
400	0.519	22.19%
500	0.667	0%

Antioxidant activity of the formulation evaluated using the hydrogen peroxide scavenging method. Absorbance of different Concentration was measured at 255 nm using a UV visible spectrophotometer. Calibration code showed excellent linearity with the regression coefficient R^2 of 0.9983 indicating reliability of the analytical method. The percentage scavenging activity was calculated and found to be the highest at lower absorbance value. Formulation exhibited maximum scavenging activity of 77.66% at 100 µg/ml, which decrease with increasing concentration.

Result and discussion:-

Present study focused on the formulation and evaluation of a topical antioxidant preparation. Various parameters including phytochemical screening, organoleptic properties, spreadability, pH, viscosity, stability, and antioxidant activity were evaluated to determine the quality and effectiveness of the developed formulation.Organoleptic evaluation revealed formulation for the smooth texture, present odor and acceptable appearance indicating good patient acceptability.Spreadability is important parameter that determine ease of application to the credibility value was increased from F1 to F3 Indicating improved formulation characteristics.pH of the formulation was found to be in the range of six to seven which is close to the neutral and suitable for the skin application. This ensure that formulation is non irritant compatible with the physiological pH of the skin.Viscosity of the formulation found to be 10,790 CPS which indicate good consistency and stability.Stability study carried out for the 30 days showed no significant change in appearance, odor, pH and phase separation which indicate the formulation is stable under the tested condition.Antioxidant activity was evaluated using the hydrogen peroxide scavenging method absorbance was measured at 255nm and the Calibration curve showed excellent linearity with an R^2 value of 0.9983 confirming the reliability of the analytical method.Overall the results indicate that the developed formulation for the significant antioxidant activity which can be attributed to presence of flavonoids and phenolic compounds.

Conclusion

Present study was successfully carried out with the aim of formulating and evaluating topical antioxidant preparation containing Herbal extract. Formulation was developed using suitable excipient to obtain a stable and effective product. Preliminary phytochemical screening confirm presence of important bio active constituent such as flavonoid phenolic compounds And iridoid glycoside which are responsible for antioxidant activity . Formulated product show satisfactory organoleptic properties evaluation parameters such as Spreadability pH and viscosity were found to be within acceptable limits. Optimise formulation exhibited maximum probability appropriate viscosity and a skin friendly pH making it suitable for the topical application. Stability study conducted over a period of 30 days showed no significant changes. Antioxidant activity evaluated by the hydrogen peroxide scavenging method demonstrated significant free radical scavenging potential, with maximum inhibition observation at lower concentration. Overall the result indicates that the developed formulation is stable effective and process significant antioxidant activity and hence it can be concluded that the formulation has good potential for you as a topical antioxidant preparation

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