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Original Research Paper

Microbiology

FORMULATION AND EVALUATION OF FACE WASH AND MOISTURIZER USING *EICHHORNIA CRASSIPES* EXTRACT

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ABSTRACT Water Hyacinth (WH) also commonly known as Eichhornia crassipes it's an aquatic free floating plant that can grow at a height of 3feet.The plant has clusters of thick waxy oval- shaped leaves with spongy stalks arising from a base of dark purple feathery roots. Eichhornia crassipes leaves are fanlike and slightly cup shaped. Though water hyacinth is causing major environmental and economic problems, but the weed has been exploited for several beneficial uses. The uses of water hyacinth include fertilizers, feed, biofuel, phyto remediation, water treatment, etc., Present work focused on the extraction of the plant content, analysis of phytochemicals (Tannins, alkaloids, carbohydrates, terpenoids, steroids and flavonoids),antioxidant, anti-inflammatory and skin care (Face wash & Moisturizer). Plant has got various potential uses in cosmetics, particularly as a natural ingredient with antimicrobial, antifungal, and antibacterial properties. Water hyacinth can be incorporated into various skincare formulations, including creams, masks, and lotions, to leverage its natural properties for skin health and well-being.These properties make it a promising choice for treating skin-related problems and for creating anti-pollution or depollution agents.

KEYWORDS : Water Hyacinth, phytochemicals, antioxidant, anti-inflammatory

INTRODUCTION

The *Eichhornia crassipes* is one of the rapid growing plants. One of its most significant advantages is its role in water purification, as it absorbs heavy metals, organic pollutants, and excess nutrients, reducing eutrophication and improving water quality. Additionally, its high biomass production makes it an ideal candidate for biofuel production contributing to sustainable energy energy solutions. In agriculture, water hyacinth is utilized as organic compost and livestock feed, enriching soil fertility and serving as a protein-rich supplement for animals. Furthermore, its fibrous structure has led to its use in handcrafts, paper production, and biodegradable materials, promoting sustainable economic activities. Despite its ecological threats, water hyacinth has gained attention for its beneficial applications in wastewater treatment, biofuel production, bioremediation, and agriculture. Studies have shown that it can effectively absorb heavy metals, organic pollutants, and excess nutrients such as nitrogen and phosphorus from contaminated water bodies, making it a valuable tool for phytoremediation (Dechassa, 2020). Furthermore, its high biomass productivity makes it a potential feedstock for bioethanol, biogas, and compost production (Nigam, 2002). Research has also explored its antimicrobial and antioxidant properties, suggesting its possible use in pharmaceuticals and cosmetics (Gajalakshmi *et al*., 2012)

MATERIALS AND METHOD

Collection Of Plant Material

The leaves of the plant *Eichhornia crassipes* was collected from Singanallur boat house, Coimbatore , Tamil Nadu in the month of November then it was cultivated in a normal tap water.

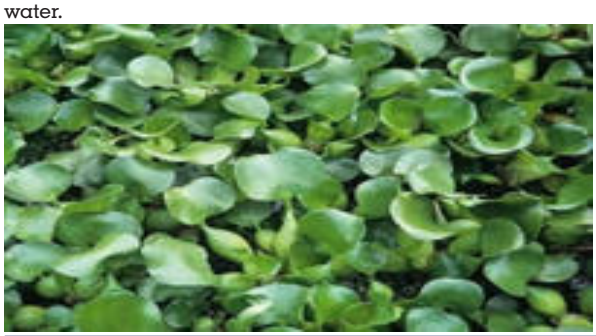

Fig : 1 *Eichhornia Crassipes* Leaves And Powder

Extraction Of Plant Materials:

The aqueous extract of the *Eichhornia crassipes* powder was prepared by refluxing the powder in 5gm in 100ml of distilled water in Soxhlet extractor for 6 hours (Shingate *et al* .,2004).The extraction of the *Eichhornia crassipes* was collected. Then the extracted solution is filtered using filter paper. It is then stored in a clean container for further use.

Fig : 2 Extraction and extracted compound

Phytochemical Activity:
The phytochemical analysis is done for the identification of the absence and the presence of phytochemicals. (Sahira Banu and Cathirine, 2015). The plants contain some organic compounds. The physiological action on the human body and the bioactive substance includes Tannins, alkaloids, carbohydrates, terpenoids, steroids and flavonoids. (Sharma.*et al*., 2012).

Flavonoids
A total of 2 mL of the fungal extract was added to 2 to 3 drops of 2% diluted NaOH solution. The yellow color change of the test indicated the presence of flavonoids.

Alkaloids
A total of 2 mL of the fungal extract was taken with a few drops of Mayer reagent and 1 ml of con. H2SO4 was added. The formation of yellow color in the test indicated the presence of alkaloids in the sample.

Tannins
A total of 2 mL of the fungal extract was taken along with 1 mL of 5% FeCl2. The color change indicated the presence of tannin in the sample. The dark green-black color formation indicated the presence of condensed tannins, and the dark blue-black color formation indicated the presence of hydrolyzed tannins in the sample.

Steroids
To 1ml of extract taken by adding of the 2ml of acetic acid and 2ml of sulfuric acid, it gives blue or green color it shows the presence of steroids.

Amino Acids
To 1ml of extract taken by adding 2ml ethanol and mixed with 2-3 drops of copper sulfate the green color change indicate the presence of amino acids.

Saponins
To 3ml distilled water and add 1ml of extract shake it vigorously there is a foam formation it shows the presence of saponins.

Terepenoids
1ml of extract is added to 2ml of the chloroform, 1ml of acetic acid and 2ml of sulfuric acid, it gives the red, pink and violet color it indicates the presence of the terepenoids.

Phenols
1ml extract is taken by adding the 1ml of ferric chloride, appearance of a black or green color indicates the presence of phenol.

Carbohydrates
The extract when mixed with 2ml of Benedict's reagent it gives the blue or green or orange color indicates the presence of carbohydrates.

Quinones
The extract was mixed with 1ml of hydrochloric acid it forms the green color which indicates the presence of quinones.

IN-VITRO ANTIOXIDANT ACTIVITY
DPPH Radical Scavenging Activity
The free radical scavenging activity of samples was measured by using 2, 2- diphenyl-1-picrylhydrazyl (DPPH) The scavenging activity for DPPH free radicals was measured according to the procedure described by (Braca *et al*., 2001). An aliquot of 3 ml of 0.004% DPPH solution in methanol and 10 to 100 μl of plant extract/ascorbic acid at various concentrations were mixed. The mixture was shaken vigorously and allowed to reach a steady state at room temperature for 30 min. Decolorization of DPPH was determined by measuring the absorbance at 517 nm. A control was prepared using 0.1 ml of respective vehicle in the place of plant extract/ascorbic acid. The percentage inhibition of DPPH radicals by the extract/compound was determined by comparing the absorbance values of the control and the experimental tubes.

IN VITRO ANTI-INFLAMMATORY ACTIVITY
INHIBITION OF PROTEIN DENATURATION ASSAY
The anti-inflammatory activity of the *Eichhornia crassipes* was evaluated as described by (Das *et al*). To assess the anti-inflammatory activity, 0.05 mL of the plant extract was taken, and various concentrations ranging from 10μg/mL, 20μg/mL, 30μg/mL, 40μg/mL, and 50μg/mL were added to 0.45 mL of a 1% aqueous solution of bovine serum albumin. The pH of the solution was corrected to 6.3 using a small amount of 1N hydrochloric acid. These samples were then incubated at room temperature for 20 minutes, followed by heating at 55°C for 30 minutes in a water bath. After the heating process, the samples were allowed to cool down, and the absorbance was measured using a spectrophotometer at 660 nm. Aspirin was the standard drug for comparison. Dimethyl sulfoxide (DMSO) was used as a control in this experiment.

ANTI-MICROBIAL ACTIVITY
WELL DIFFUSION METHOD
The antibacterial activity of *Eichhornia crassipes* extract was determined by Well Diffusion method (Dubey *et al*., 2012) against bacterial pathogens. MHA plates were prepared by pouring 20ml of MHA media into sterile petri plates. After solidification 30-25ul suspension of bacterial inoculums was swabbed uniformly. Then 50ul and 100ul concentration of plant extract was poured into the wells. After that, the plates were incubated 37°C for 24 hours, Assay was carried into triplicates. Zone of inhibition was measured from the edge of the well to the zone in mm. Then plates were incubated at 37°c for about 24 hours and control was also maintained. Zone of inhibition was measured from the clear zone in mm.

Preparation Of Facewash
Formulation method: Slurry was prepared using xanthan gum, glycerin and plant extract. Slurry was added to the distilled water. In a separate container decyl glucoside was mixed with tea tree oil and lavender oil. The surfactant and essential oil mixture was added to the xanthan gum base. Mixed well and transferred to air tight container. The color of the face wash was checked against white background. (Varshana Patil *et al*.,2023).

Irritancy And Absorbency Test:
The skin irritation was carried out on human volunteers. For formulated face wash, volunteer were selected and 1.0 g of formulated face wash was applied on an area of two square inch to the back of the hand. The volunteers were observed for lesions or irritation. Formulation was applied on the Skin & then ease extent of washing with water were checked manually.

FORMULATION OF MOISTURIZER
The Bees wax and almond oil was mixed properly by double boiling method. Thereafter the remaining ingredients are mixed with the initial ingredient using a blender and avoid air bubbles. The creamy texture of moisturizer was transfer to a sterile air tight container.

Irritancy And Absorbency Test:
The skin irritation was carried out on human volunteers. For formulated moisturizer, volunteer were selected and 1.0 g of formulated moisturizer was applied on an area of two square inch to the back of the hand. The volunteers were observed for lesions or irritation. Formulations were applied on the Skin &

then ease extent of washing with water were checked manually.

RESULT

The phytochemical analysis was done for done for the plant extracts and the result showed in Table 3. The phytochemicals such as alkaloids, flavonoids, phenols, quinones, carbohydrates, saponins, steroids, and amino acids indicate the presence of activity in aqueous extraction .The phytochemicals activity such as terepenoid, tannins indicates the absence of activity.

Free radical scavenging ability of the sample was tested by DPPH (2,2-diphenyl-1- picrylhydrazyl (DPPH) radical scavenging assay. The absorbance of the mixture was measured spectrophotometrically (UV-Visible spectrophotometer) at 517 nm.

Anti-inflammation Activity

The Anti-inflammatory activity of the test sample was tested by protein denaturation assay. The absorbance of the mixture was measured by spectrophotometrically at 517nm.(Ageel,2005)

Table : 1

Concentration	Standard Values (Aspirin) Control-0.500	Sample Values (Control-0.600)
100 µl	1.00	0.31
200 µl	1.40	0.43
300 µl	1.43	0.48
400 µl	1.45	0.62
500 µl	1.78	0.77

Antimicrobial Analysis

The antimicrobial was performed with four different strains. The zone of inhibition in the plates represents the developed plant extracts has antimicrobial activity against test pathogens namely *E.coli, Staphylococcus aureus, Bacillus, Klebseilla*. The zone of inhibition was measured and tabulated.

Table : 2 Antimicrobial Activity

S.No	Organisms	Zone of Inhibition of Aqueous Extraction
1.	*E.coli*	14nm
2.	*S.aureus*	13nm
3.	*Bacillus*	13nm
4.	*Klebseilla*	16nm

Facewash stability was checked after I week and 3weeks which was kept at room temperature and showed similar to the original product, no change in the colour and consistency.

Moisturizer stability was checked after I week and 3weeks which was kept at room temperature and showed similar to the original product, no change in the colour and consistency.

DISCUSSION

The formulation and evaluation of a facewash and moisturizer using *Eichhornia crassipes* (water hyacinth) as a key ingredient have yielded significant findings, demonstrating the potential of this aquatic plant in the development of sustainable and effective skincare products. This study aimed to address the growing demand for natural, eco-friendly, and innovative cosmetic ingredients while utilizing Eichhornia crassipes, a plant often considered an invasive species and environmental nuisance. The research successfully incorporated extracts of Eichhornia crassipes into cosmeceutical formulations, leveraging its antioxidant, anti-inflammatory, and antimicrobial properties to create products that are both functional and environmentally conscious.

CONCLUSION

The formulation and evaluation of facewash and moisturizer using Eichhornia crassipes have demonstrated that this plant can be effectively utilized in the development of innovative skincare products. The study provides a foundation for further research into the potential applications of Eichhornia crassipes in cosmetics, including the exploration of its long-term effects, scalability, and commercial viability. Future studies could also investigate the synergistic effects of combining Eichhornia crassipes with other natural ingredients to enhance its benefits and expand its applications. Overall, this research contributes to the growing body of knowledge on sustainable cosmeceuticals and highlights the importance of integrating environmental sustainability in to product development.

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