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FORMULATION, VALUE-ADDITION AND EVALUATION OF GREEN TEA LIQUOR-BASED MOISTURIZING FACE CREAM

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ABSTRACT

Studies on the uses of different plant extracts in the cosmetic industry as cosmeceuticals are gaining popularity worldwide mainly due to their promising bioactivities, especially antioxidant and anti-inflammatory action, which could be exploited in several ways for the preparations of various types of creams. This shift towards plant-based product is happening mainly due to our constant urge to return to nature and natural ingredients like Tea (*Camellia sinensis* L.) extract for safer and chemical-free alternatives. Along with being used as a beverage, tea can also be used in many other ways like nutraceuticals, different cosmeceuticals and in the preparations of various kinds of herbal tea, flavored tea and medicinal tea etc. all of which are the examples of value-added products of tea. Creams made of green tea are known to add advantage to any product as it works as an antioxidant. Continuous use of this cream will increase the smoothness of the skin and it will definitely lighten the skin tone gradually. Commercially available creams that give instant fairness to the skin are prone to damage the skin very easily and have other side effects too. But this tea extract-based organic cream will have no side effects and will give extra nourishment to the skin.

The present study was carried out with the main objective of introducing green tea liquor-infused moisturizing cream as one of the value-added products of tea or to do value addition of the existing creams with tea. With essential qualities like acting as a powerful antibacterial agent, maintaining collagen levels, treating acne, and soothing the skin, tea is a beauty fundamental and was thus exploited in the present study for the value addition of a moisturizing cream. This moisturizing cream was prepared using green tea, different oils, stearic acid, acetyl alcohol, shea butter, honey, glycerin, emulsifying wax, etc. The preparation of the cream involved both oil phase and water phase. At the beginning of the preparation, oil phase was prepared assembling the ingredients and then water phase was prepared having the same temperature as oil phase. Then both the phases were mixed and stirred continuously. When the mixture was sufficiently cooled, the fragrance oil was added and the cream was kept in a neat and clean container. The quality of the cream was analyzed with respect to patch test, smoothness test, irritability test, absorbability, stability, etc. The findings of the present study therefore, suggest that green tea-infused liquor can be successfully used in value addition of various types of creams and this should be further exploited for finding a safer alternative to harmful chemicals.

***Key words*:** Green tea liquor, value addition, antioxidants, moisturizing cream, stability,

Introduction

Tea is known as world's second-largest beverage. Natural ingredients like tea if mixed with cosmetic products assures safety and good quality of the product. Polyphenols, catechins, flavonoids and antioxidant present in tea help to block damage to skin, curb premature aging, help prevent skin infections, protect the skin, balance sebum and decrease signs of aging such as hyper-pigmentation and fine lines. The tannins and caffeine in the tea are known to reduce blood vessels and reduce

Table 1: List of Equipments.

Equipments
Electric cooker
Glass beaker 500 ml, 2pc
Cake beater
Silicon spatula
Stainer
Stainless steel spatula
Measuring flask
Watch glass
Thermometer
Foil paper
Cotton cloth
Hand blender
pH stripes
Digital balance

the puffiness. Tea contains many other active compounds that are increasingly used in cosmetics such as sunscreen. Recently it was revealed that the combination of green tea extract with zinc oxide and titanium dioxide in sunscreen preparations increases skin protection against damage caused by UVA and UVB rays. [Koch *et al.*, (2019), Ferrazzano *et al.*, (2009), Wang *et al.*, (2010)]. The addition of tea in different items to make it more useable is termed as value addition or diversification of products. Nowadays almost all varieties of tea is being used in making several cosmeceuticals like creams, moisturizers, sunscreens, hair conditioners, foundations, face masks, soaps, toothpaste shampoo, etc. In the light of change, cosmetics made up of tea which are free of harmful substances or toxic substances are gaining acceptance. The properties of tea and its use in cosmetics have been experimentally proven to be very effective for skin products. So, today tea cosmetics are being used in large quantities by everyone for their desired properties. The main purpose of this research work was to use tea in cosmetic products like moisturizing face cream to improve or repair skin damage and to evaluate its potential as one of the key ingredients in face cream.

Table 2: Materials and their Source.

Materials used	Source
Green tea	Bought online (Amazon), Twinings pure Green Tea.
Olive oil	Bought online (Amazon), BORGES EXTRA VERGIN Olive oil.
Sunflower oil	Bought online (Amazon), NATURE LAND ORGANICS.
Honey	Bought online (Amazon), NATURE TRUST FOREST HONEY.
Essential oil	Bought online (Amazon), Exotic Aromas Essential oil.
Shea butter	Bought online (Amazon), Desicrew Pure Organic shea butter
Vegetable glycerin	Local market.
Emulsifying wax	Bought online (Amazon), BRM Chemicals Emulsifying wax.
Cetyl alcohol	Bought online (Amazon), Purenso Select cetyl alcohol.
Stearic acid	Bought online (Amazon), BRM Chemicals stearic acid.
Distilled water	Local market.
Preservative	Bought online (Amazon), Ases Phenoxyethanol Broad spectrum preservative.

Table 3: Materials and tehir Quantity.

Ingredients	Quantity
Green tea	2 table spoons
Shea butter	6 grams
Sunflower oil	11 grams
Olive oil	4 gm
Emulsifying wax	6 gm
Stearic acid	2 gm
Cetyl alcohol	2 gm
Honey	1 gm
Glycerin	1 gm
Distilled water	70 ml
Essential oil	6-8 drops
Preservative Euxyl K 903/Geogard 221	1 gm

Materials and Methods

Materials used for preparation of moisturizing cream

Method of Formulation

- **Preparation of Water phase:** 70ml of distilled water was boiled and to it1 teaspoon of green tea was added in the boiling water. Tea liquor was then removed from the gas stove and kept at room temperature for 10 minutes. The green tea-infused water was then strained in a beaker. When the temperature was cooled down sufficiently, glycerin and honey were added and mixed with the help of a spatula.
- **Preparation of Oil phase:** Shea butter, sunflower oil, olive oil, emulsifying wax, stearic acid, cetyl alcohol were all measured in a glass beaker as per requirement. Next these were boiled using double boiler method till all ingredients melted properly. The temperature was constantly monitored and was maintained at 70ºC.
- **Mixing of both the phases:** Distilled water was heated in a beaker using double boiler method up to the same temperature (70ºC) as the oil phase. The water phase was then mixed with

Table 4: Parameters and Observation.

S. no	Parameters	Observation
1	Color	Off white
2	Type of cream	Moisturizing cream
3	Homogeneity	Homogeneous and smooth
4	pH	5.2
5	Washability	Washable
6	Consistency	Good
7	Grittiness	No grittiness
8	Irritancy test	No irritation found
9	Accelerated stability studies	Stable
10	Type of smear	Little- greasy
11	Patch test	Not hypersensitive
12	Spread ability	Uniform
13	Dye test with scarlet red	w/o type
14	Acid value	5.06
15	Saponification value	75.735

the oil phase and stirred with a spatula for 2 minutes. This step was followed by smooth mixing with the help of a hand blender for five minutes. The mixture was then rested for 2 minutes and blended again for 3 minutes. When the mixture attained cream consistency and the temperature was sufficiently cooled down, the required amount of preservative was added and blended for a minute. Finally, the fragrance oil was added and blended for a minute again.

The preparation procedure of the cream step-wise is illustrated in Fig. 1.

Evaluation of the cream

The formulated cream was evaluated with regard to the following parameters [Badwaik *et al.,* (2022), Vigneshwaran *et al.,* (2022)].

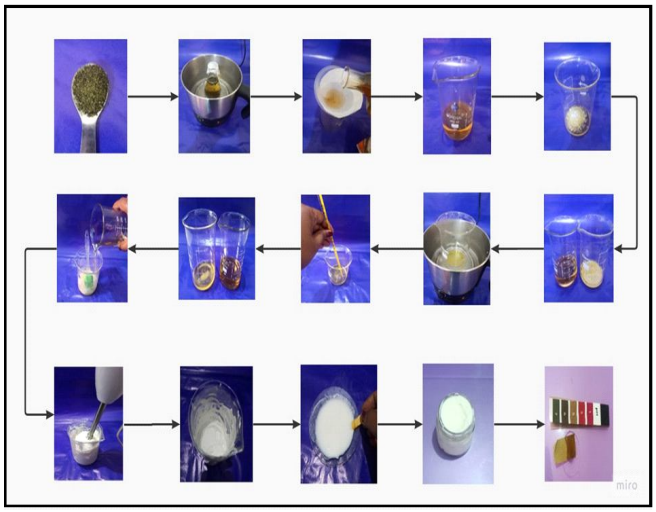

Fig. 1: Preparation of green tea moisturizing cream.

Value addition

Tea extracts possess a wide spectrum of biological activities, which makes them precious components not only for pharmaceutical applications but also for the cosmetics industry. Among these activities, antioxidant properties, photoprotective nature, anticellulite activity, slimming property, improving skin, hair and microcirculation properties are of utmost importance and are often exploited for commercial use. Green Tea is renowned for its antioxidant and free radical properties, making it the ideal ingredient for anti-aging, moisturizing, skin protecting and mature skin products. The present study, therefore, relied upon the use of green tea liquor for the value addition of a moisturizing cream which was formulated using standard laboratory techniques. This kind of value addition and product diversification is known to increase consumer acceptance and also facilitate better sales in domestic as well as global markets.

Evaluation of the cream

Organoleptic Evaluation

The moisturizing cream thus formulated was evaluated for its organoleptic properties like colour, odour and state. The appearance of the cream was judged by its colour and roughness and graded [Tan *et al.,* (2022)].

- **pH:** The pH of the cream was tested using both pH paper and a pH meter. 2 gm of the cream was measured and taken in a watch glass, then mixed with 8 gm of distilled water. pH stripe was put into the watch glass and the color changed to light brown which symbolizes that the pH lies in the range of 5-6. For more accuracy, a digital pH meter was also used to check the pH which was found to be 5.2. Fig. 2.
- **Dye test-** For performing this test, safranin dye was mixed with a small amount of cream on a slide and then observed under the microscope placing a cover slip over the cream. The dispersion phase showed pink colored globules in the microscopic field which proved that the

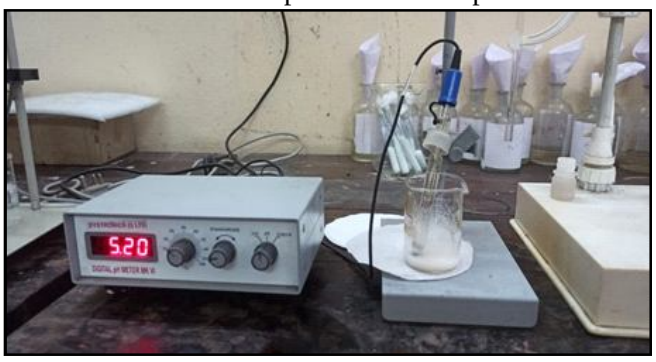

Fig. 2: pH test.

cream was of o/w type. Fig. 3 and Fig. 4.

- **Appearance-**The appearance of the cream was found to be off-white by observing its color with the naked eye [Kamble *et al.,* (2023)].
- **After feel-**After applying the cream on the skin, a few things were tested such as the tendency to stick to the skin and how much cream remained after application.
- **Smear type-** After the application of the cream this test was conducted which showed an oily smear.
- **Homogeneity-** This test was conducted by visual appearance and by touching the cream by hand [Mishra *et al.,* (2014)].
- ***Greasiness***- Here, a little amount of cream was put on the skin's surface, and its grease- or oil-likeness was assessed [Valarmathi *et al.,* (2020)]. The made cream was found to be non-greasy. [Patil *et al.,* (2023)].
- **Patch test-** This test was done by placing a few grams of cream on a clean white cloth and applying it on the bend of the elbow for 10 days applying it twice a day. The type of patch was observed after 12 hours after application and observed thoroughly during the next 10 days. No reaction was found to occur even after 10 days of application which clearly suggested that the cream was not allergic to the skin and is safe for application.

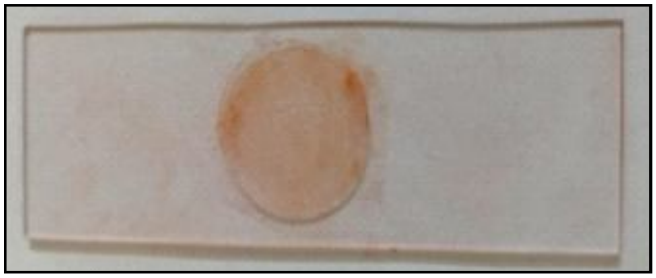

Fig. 3: Dye test.

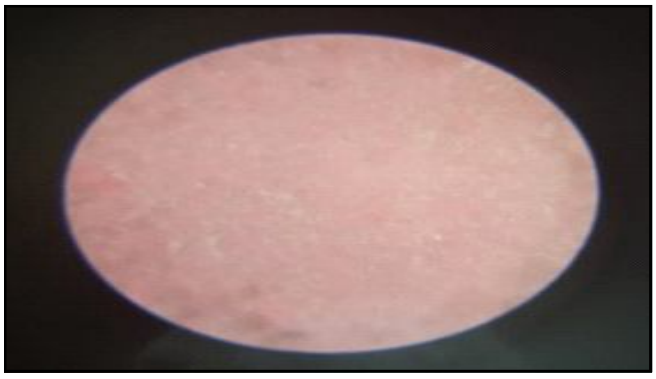

Fig. 4: Microscopic view.

- **Removal-** The applied cream could be easily removed by washing under normal tap water [Davkhar *et al.,* (2023), Tegeli *et al.,* (2019)].
- **Irritancy test-** The cream was applied on the upper side of the right hand and observed after regular intervals up to 12 hours to check whether any scar formations, irritation, itching or redness occurred or not [Navindgikar *et al.,* (2020)]. The irritancy test showed no such irritations or rashes.
- **Acid value-** 10gm of the prepared cream was dissolved in an accurately weighed 50 ml mixture of an equal volume of alcohol and solvent ether, the flask was connected to a reflux condenser and slowly heated until the sample was dissolved completely. 1ml of phenolphthalein was then added and titrated with 0.1N NaOH, until fatty pink color appeared after shaking for 30 seconds and the acid value was calculated using the following formula (Fig. 5, 6).

Acid value = n×5.61/w

Where,

n= the no. of ml of 0.1N KOH solution.

W= the weight of substance in gram

- **Saponification value**- 2gm of cream was refluxed with 25ml of 0.5 N alcoholic KOH for

Fig. 5: Acid value test.

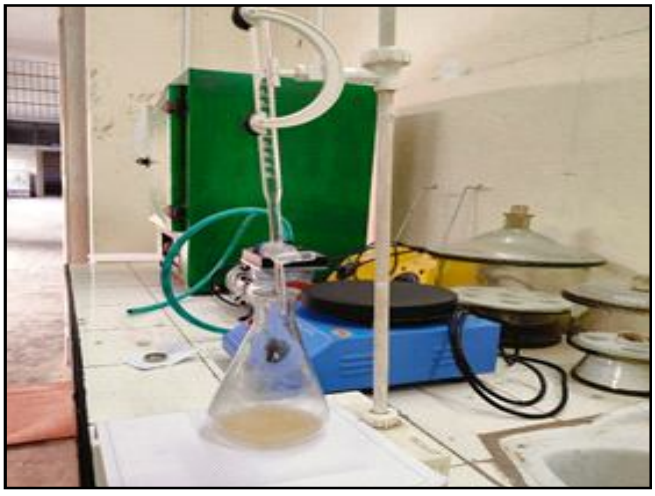

Fig. 6: Acid value test..

30 minutes, to this 1ml of phenolphthalein was added and titrated immediately, with 0.5N HCL, this reading was noted as 'a'. Repeated the process again without using the cream this reading was noted as 'b' and the saponification value was then calculated using the following formula (Fig. 7, 8, 9, 10).

Saponification value= (b-a) ×28.15/w

Where,

W= weight of substance in gram.

Test for microbial growth in formulated Cream:

The formulated cream was inoculated on the plates of agar media by streak plate method and a control was prepared by excluding the cream. The plates were placed into the incubator and were incubated at 37°C for 24 hours. After the incubation period, plates were taken out and checked for the microbial growth by comparing it with the control.

Fig. 7: Saponification test.

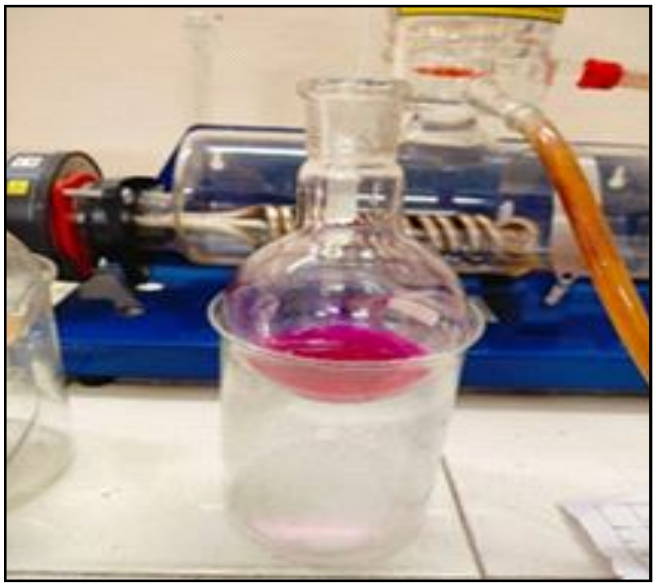

Fig. 8: Saponification test.

Stability Test

In the mechanical test cream samples were inserted into a centrifuge tube at a speed of 3750 RPM for half an hour or 5000 to 10000 RPM for 15 Minutes then observed whether a separation exist or not [Saini (2023), Sahu *et al.,* (2012)].

Result of Stability Studies

The stability studies were performed to assess the stability of the formulation at room temperature and at elevated temperatures. The formulation was stored at room temperature and at a temperature above 40 degrees centigrade and observed for changes in coloration, stability etc. The study revealed that the formulation was relatively

Fig. 9: Saponification test

Fig. 10: Saponification test.

stable but slight changes in colouration occurred at higher temperatures

Result and Discussion

The findings of the present study reveal that the moisturizing cream prepared using green tea liquor is at par with the other commercially available creams with regard to its quality and efficiency and is in fact more enriching and skin-friendly in comparison to other creams because of value addition. Therefore, the potential of the green tea liquor should be further explored and its application in the preparations of different cosmetic products should be encouraged, in compliance with the safety standards.

The cream was prepared in clean and hygienic environment in a laboratory following standard techniques. It was a cream made by water to oil emulsion method using green tea in water and other commonly used ingredients. All ingredients used for value addition and quality enhancement were herbal products so the made cream turned out to be very good in moisturizing, soothing, was stable and passed all the needed quality tests. The prepared formulation had good spreadability, pH, was non greasy and could be easily washed with water. The formulation was non–irritant and caused no harm to the skin and did not show any phase separation during storage. It is suggested that the prepared cream was physico-chemically stable and possessed features of a good formulation for skincare. The evaluation of the cream with regard to various parameters have been summarized below.

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Conflicts of interest: The authors declare no conflict of interest.

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