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Development of Hydra-Emulsion Based Lotion of *Manilkara zapota* & Carrot Oil for Anti-Aging & Sun Protection Activity

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Abstract

Nowadays herbal cosmetics are in demand to avoid the side effects caused by synthetic cosmetics. Herbal cosmetics gave multiple effect with single formulation with no side effects. It is also suitable for all type of skin. Lotions are non-corrosive liquids for external use. Apply directly to your skin using an absorbent material such as soaked cotton or gauze. The lotion maintains the skin's moisture level by trapping moisture, making the skin healthy and flexible. Unlike creams, lotions are less oily and contain more water. This work includes the formulation of hydra-based lotion containing Manilkara zapota leaves extract & carrot oil which gives antioxidant, antifungal, antibacterial, anti-aging and sun protective activity. This body lotion was evaluated by different evaluation parameters such as organoleptic characteristics, pH, homogeneity, viscosity, spreadabilty and irritancy test, stability testing. All our F1, F2 and F3 formulations show good appearance, pH value, adequate viscosity and no phase separation. Additionally, Formulations A, B, and C showed no redness, erythema, or irritation in testing and were easy to clean.

Keywords: *Manilkara zapota*, Carrot oil, Hydra-based lotion.

INTRODUCTION

Finding a solution to tackle the aging symptoms has been an obsession of humanity for centuries. This desire has led to the use of cosmetics to change the appearance of the skin since ancient times and has led to the emergence of a large industry today [1]. The desire to look young is so strong that the global skin care market is growing rapidly. The value is expected to reach 155.4 billion US dollars by the end of 2021[2]. That's why the market is flooded with cosmetics that claim to deliver great results in a short time. However, many of these cosmetics contain harmful ingredients or formula components. Some toxic ingredients are not legally labeled.

Manilkara zapota (L.) Sapotaceae has been used as an ayurvedic herb in India for more than a decade. The fruits and leaves of sapodilla or sapodilla are known to be good sources of antioxidants. Ethanol pulp extract contains alkaloids, saponins, terpenes, flavonoids, tannins, free anthocyanins, anthraquinones, glycosides and catechols. Bioactive flavonoids such as (-)-epicatechin, (+) -gallocatechin, gallic acid, quercetin, myricetin and (+)-catechin were found in the methanol extract of Sapota fruit. It has been reported to inhibit collagenase and elastase activities [4].

Anti-aging cosmetics based on herbal skin nutrients can solve the shortcomings of synthetic cosmetics. Carrot seed oil and Manilkara zapota are used in cosmetics to prevent wrinkles and rejuvenate the skin. Due to its effect on the formation of epidermal cells, it also helps reduce age spots and make skin a younger.

Lotions are liquid preparations intended to be applied externally on broken skin without friction. Lotion either liquid or semisolid preparation that contains one or more active ingredient in an appropriate vehicle. Lotions are available in the form of emulsion or suspensions generally in an aqueous vehicle and in the form of solutions because of either their appearance or easy application. They are formulated as oil in water or water in oil emulsion [6-11].

This work includes the formulation of hydra based herbal lotion containing Manilkara zapota leaves extract & carrot oil which gives antioxidant, antifungal, antibacterial, anti-aging and sun protective activity.

MATERIALS AND METHODS

Plant

Leaves of *Manilkara zapota* were collected from the local areas of Butibori, Nagpur, Maharashtra, India. Ethanol, xanthan gum, carrot oil, coconut oil, tween 80, span 80, deionized water, nutrient agar media pharmaceutical grade purchase from vendor.

Preparation of Plant extract

The leaves of *Manilkara zapota* are dried in the shade for almost a week to avoid chemical degradation caused by sunlight. The dry material is ground into coarse powder using a grinder. 40 g of *Manikara zapota* leaf powder was extracted in a Soxhlet extractor using petroleum ether and ethanol as solvents. The solvent was removed under reduced pressure to obtain a residue of the extract. Then the filtrate was kept in the oven at 60 °C and evaporated to dryness and dried extract were collected, stored in airtight container and subjected for further studies.

Preparation of plant crude leaf extract

Preliminary Phytochemical study of Manilkara zapota leaves extract

Alkaloid

Wagner's test: -A few drops of Wagner's reagent were applied to 2mg of extract that had been acidified with 1.5 percent v/v hydrochloric acid. The presence of alkaloids is indicated by a yellow or brown ppt.

Carbohydrates

Molisch test: - 2 mg of ethanol extract was mixed with 10 ml of water, filtered, concentrated. Add 2 drops of sulfuric acid to a freshly prepared 20% α-naphthol alcohol solution, a layer will form on the red-red ring of the mixture, indicating the presence of carbohydrates, this layer will disappear when sufficient. alkali was added.

Amino acid

Ninhydrin test: Boil for a few minutes 2 ml Ninhydrin reagent + 2 ml extract. The production of blue colour indicaxtes the presence of amino acids.

Steroids

Salkowski Reaction: 2 mg of dry extract is mixed with chloroform and sulfuric acid is slowly penetrated into the chloroform layer from the side of the test tube. The appearance of red indicates the presence of steroids.

Tannin

A few drops of a 5 percent w/v Fecl3 solution were added to 1-2 ml of the ethanolic extract. Gallo tannins are shown by a green colour, whereas pseudo tannins are indicated by a brown colour.

Flavonoids

When 2 ml of each extract is mixed with a few drops of 20% sodium hydroxide, a pale-yellow color is observed. Add a few drops of 70% dilute hydrochloric acid and the yellow color disappears. The presence of flavonoids in extracted samples is indicated by the appearance and disappearance of a yellow color.

Saponins

6 ml distilled water was added to 2 ml of each extract and rapidly shaken; the presence of saponin is indicated by the production of bubbles or persistent foam.

Proteins

Add 1 ml of 40 % sodium hydroxide and a few drops of 1% copper sulphate to 2 ml of extract. The appearance of violet colour shows the presence of peptide linkage molecules in the extract.

Glycosides

Add 0.5 ml of glacial acetic acid and 3 drops of 1% aqueous ferric chloride solution in to 1 ml of extract. The formation of a brown ring at the interface shows the presence of glycosides.

Terpenoids

1 ml of herbal extract is mixed with 0.5 ml chloroform and a few drops of sulphuric acid to develop a reddish-brown precipitate that indicates the presence of terpenoid [12-15]

Preparation of Hydra-emulsion lotion

Emulsion-based emulsions are prepared using Hydrophile-Lipophile Balance (HLB) technology. Briefly, the oil phase containing sesame oil, coconut oil, and Span 80 was mixed with the aqueous phase containing xanthan gum in deionized water containing Tween 80 using a mixer. Add all the ingredients to this. Then add the prepared *Manilkara zapota* leaf extract until the mixture becomes homogeneous. Dilute to volume with deionized water and store moisturizing emulsion in an airtight container [16].

Evaluation Hydra-emulsion lotion

Organoleptic characteristics

Physical parameters such as color and appearance were checked.

Homogeneity

It was analyzed by visual inspection for the appearance and existence of any clog.

Presence of Foreign Particles

A suitable amount of lotion was spread on a glass slide which is free from grease and was observed against the diffused light to check for the presence of any foreign particles in formulation.

Measurement of pH

It was measured by using digital pH meter.

Viscosity

The stability and application behavior of lotions is important factors for acceptance. The viscosity lotions are influenced by the ingredients and production process. The lotion viscosity was lower than cream due to higher liquid content in lotions. Viscosity was determined by using Brookfield viscometer using suitable spindle at 50 and 100 rpm.

Spreadability

The 2g of lotion was placed between the slides and 200 g weighted for 5 minutes was placed on the top of 2 slides to expel air to provide a uniform lotion film between the slides where excess lotion was scrapped off the edges. The time noted by the top slide (in seconds) to cover a distance of 7.5 cm must be noted.

$$S = M.L / T$$

Where,

M, Wt. applied to upper slide

L, Length of glass slide

T, Time taken to separate the slide

Irritancy Test

The lotion was applied on the dorsal left-hand surface of rat skin. Irritancy, erythema, edema was checked visually at every hour up to 24 h and the observations were noted.

***In-vitro* Sun protective factor determination**

Transfer 1.0 g of the prepared emulsion to a 100 ml volumetric flask and dilute with ethanol to the desired volume. Further, sonicate for 5 min and filter with a cotton filter, discarding the first 10 ml. Transfer a 5.0 ml aliquot to a 25 ml volumetric flask and adjust the volume with ethanol. The absorption spectrum of the sample in solution was obtained every 5 nm in the range of 290-320 nm by making 3 measurements at each point and the Mansour equation was used.

$$\mathbf{SPF}_{\text{spectrophotometric}} = CF \times \sum_{290}^{320} EF(\gamma) \times I(\gamma) \times Abs\ (\gamma)$$

Where,

- EE(I), erythemal effect spectrum
- I(I), solar intensity spectrum
- Abs, absorbance of the sunscreen product
- CF, correction factor (10)
- EE × I, constant.

The aim of this study was to investigate the SPF of anti-aging hydra lotion formulation by *in-vitro* study using an UV spectrophotometer [17].

RESULTS AND DISCUSSIONS

Extraction and Phytochemical identification

Plant collected and extracted successfully by soxhlet process. Phytochemical investigation of extract was done successfully and results are given in table no 2.

Organoleptic charactristics

All the three lotions show following characteristics

- Color: Creamish
- Odor: Characteristic
- Consistency: Smooth

Homogeneity

From the 6 weeks of observation, it was found that there was no clog in the lotions. The results showed that the lotion formulation was homogeneous, due to proper prior grinding of the base materials.

Presence of Foreign Particles

From the observation it was observe that there were no foreign particles present in the lotion formulation, due to a tightly closed container used to store the formulation.

pH Determination

The pH value of lotions was ranging from 4.7 to 6.0 which is matched with the pH of normal skin, ranging from 4.0 to 7.0. The finally selected lotion pH was found to be 6.14.

Viscosity Determination

Viscosity of lotion as were done by Brookfield viscometer. The spindles were taken as per approximate rheology of formulated lotion at 50 and 100 rpm with respective spindle viscosity were noted.

Spread ability

Lotions was showed shear-thinning behavior so spread easily. There was a correlation between spread ability values with viscosity values, the viscous fluid has a less spreadability.

Irritancy Test

All lotions were safe and do not show any skin irritation, lesion or inflammation. All tested formulations were well tolerated. This result showed that all ingredients and concentrations of all ingredients were safe.

***In-vitro* sun protective factor**

The SPF value for prepared lotion were found to be given in table no. 4

Figure 1: Extraction of *Manilkara zapota* by soxhlet method

Figure 1: Formulation of *Manilkara zapota* hydra-emulsion lotion

Table 1: Formulation Table of hydra-emulsion lotion

Ingredients	**F1**	**F2**	**F3**
Manilkara zapota leaves extract	1gm	1gm	1gm
Carrot oil	2ml	2ml	2 ml
Xanthan gum	0.5gm	1.0gm	1.5gm
Coconut oil	7.5ml	7.5ml	7.5ml
Tween 80	2 ml	2 ml	2 ml
Span 80	4.5ml	4.5 ml	4.5 ml
Propyl paraben	0.03ml	0.03ml	0.03ml
Deionized water q.s	100ml	100 ml	100ml

Table 2: Phytochemical investigation of extract

S No	Test	Observation	Result
1	Alkaloids	Brown color ppt formed, pass the test.	+ve
2	Amino acid	Blue color ppt not formed, fail the test.	+ve
3	Carbohydrate	Red color ppt formed, pass the test .	+ve
4	Protein	Violet color formed, pass the test.	+ve
5	Glycoside	Reddish brown ppt formed, pass the test.	+ve
6	Tannins	Green color ppt formed, pass the test	+ve
7	Terpenoids	Reddish brown ppt formed, pass the test.	+ve
8	Saponins	No foam is formed, fail the test.	+ve
9	Flavonoids	Yellow color ppt formed, pass the test.	+ve

Table 3: Result of lotion viscosity at 50 and 100rpm

Spindle	Formulation	At 50rpm	At 100rpm
7	F1	980cp	860cp
7	F2	1080cp	950cp
7	F3	1380cp	1020cp

Table 4: Result of In-vitro sun protective factor of lotion

S No	SPF value
Formulation 1	3.74
Formulation 2	5.24
Formulation 3	6.08

A better SPF was observed for lotion formulation with 6.08 SPF value, thus the formulation 3 were found as good SPF activity.

CONCLUSION

Manilkara zapota extract and carrot oil were incorporated in topical lotion. In evaluation parameter it observes that 1.5% concentration of xanthan gum containing lotion having a good consistency and spreadability. The formulated lotion was found to be creamish in color with characteristic odour with pH 6.14 suited for topical formulation. From all lotion formulations F3 was the most preferred lotion. From the research it can be concluded that *Manilkara zapota* herbal lotion may be useful for the purpose of anti-aging and sun protection activity. The prepared *Manilkara zapota* topical lotion is the best alternative for synthetic drug with less side effect. It is suitable of all type of skin because of herbal ingredients.

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Conflict of Interest

None declared.

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