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Research Article

**FORMULATION AND EVALUATION OF COLD CREAM
INCORPORATED WITH *CITRUS SINENSIS* AND *ALOE
BARBADENSIS* MILLER**Najuma Shajahan^{*1}, Nandini O B^{*1}, Reeba Roy^{*1}, Swathi S^{*1}, Hashima Asim Khan^{*1},
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Thiruvananthapuram, Kerala, India**Abstract:**

A cosmetic product is defined as any substance or preparation intended to be placed in contact with the various external part of human body. Cosmetics are the preparations used to beautify and enhancing the human appearances. The cold cream is prepared by using the orange peel oil and aloe vera gel. The aim of this study was to prepare a cold cream for the purpose of moisturizing, brightening and for treating tan. Aloe barbadensis miller and Citrus sinensis are used as the main ingredients to make the cream. The choice of ingredients is based on the various medicinal properties of these agents. The cream is tested on different evaluation parameters.

Keywords: *Aloe vera, Cold Cream, Cosmetics, Orange peel,*

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INTRODUCTION:

The cosmetics are the word derived from Greek word – ‘kosmesticos’ which means to adorn. From that time the materials which are used to promoting appearances or to beautify the skin are called as cosmetics. Cosmetics are the external preparations, which are applied to skin, hairs, nails for various purposes like protecting, covering, coloring, beautifying, cleansing, and nourishing. Cosmetic production and formula development has evolved over the years from the days of Galen (150AD) to the present era of automation and computerization. The demand for cosmetic products, particularly in urban population, is steadily rising owing to various reasons. The use of cosmetics as substances to enhance or protect the beauty of the human body¹.



Fig 1: Cosmetics

CATEGORIES OF COSMETICS

Cosmetics may be categorized according to the body part over which they are applied. All cosmetics are typically intended to be applied externally to the face (on the skin, lips, eyebrows, and eyes), to the body (on the skin, in particular the hands and nails), and to the hair. The cosmetics have been categorized into,

1. Cosmetics for Hair
2. Cosmetics for Nails
3. Decoration of Dental care
4. Cosmetics for Skin

SKIN COSMETICS

The purposes, functions, and roles of skin care cosmetics such as face cleansing cosmetics, lotions, milky lotions, creams, gels, essences (beauty lotions), packs and masks, shaving cosmetics and several other products (for example, powder and cleansing oil). The functions of skin care cosmetics include cleaning the skin, preserve the skin's moisture balance, stimulate skin metabolism, and protect the skin from harmful ultraviolet radiation. Skin care cosmetics contain substances which enable the skin to function properly. They support its homeostasis function so that it is maintain in a beautiful and healthy condition or regains such a state if it is not.

COLD CREAM

The term ‘cold’ is possibly due to the cooling sensation caused by evaporation of the water in the cream after it is applied to the skin. Cold cream is moistening as they provide an oily barrier which reduces the water loss from stratum corneum⁶. Cold creams are an emulsion of water and certain fats that is used to smooth skin and remove makeup. In the cosmetic industry, called creams consist of water-in-oil emulsions that are made by using beeswax and alkali, usually borax, as the emulsifying agent. The emulsifying agent used in the cold cream type is really a soap formed *in-situ* by the interaction of borax with the free acid of the beeswax. Borax or sodium tetra borate is usually marketed as a decahydrate. Borax is hydrolyzed by water and the solution has marked alkaline reaction. It is a cosmetic that calms and

cleanses the skin; it often has an oily and heavy consistency.



Fig 3: Cold cream

AIM AND OBJECTIVES

AIM

To formulate and evaluate the cold cream incorporated with *Citrus sinensis* and *Aloe barbadensis miller*.

OBJECTIVES

1. To prepare the cream by using the emulsification technique.
2. To evaluate safety, efficacy and quality of the cold cream.
3. To evaluate they are non-irritant when applied on skin.
4. To provide slow evaporation of water phase which leads to cooling sensation.
5. To formulate and evaluate the cold cream for glowing skin by using *Citrus sinensis* and *Aloe barbadensis miller*.
6. To synthesize a cold cream ideal for long-lasting hydration.
7. Collection of chemicals and reagents for the formulation and evaluation of cold cream.

MATERIALS AND METHOD:

MATERIALS AND APPARATUS

Raw materials and Excipient Profile

All the materials used in the present study i.e., white bees wax, liquid paraffin, borax, orange peel oil, cinnamon oil, aloe vera gel, rose water, distilled water, were purchased from local market. The details of materials used for the formulation of cold cream is mentioned below⁹.

1. White Beeswax

Beeswax has becoming more widely used in cosmetics and skin care products. It has proved to be more effective than similar barrier creams, which are often based on mineral oil and include petroleum jelly.

Synonym: Paraffin-wax, Carnauba.

Biological source: It is a product made from the honeycomb of the honeybee and other bees.

Family: Apidae

Chemical constituents: The main chemical constituents are carbon (73.3%), hydrogen (13.2%) and oxygen (7.5%).

Therapeutic uses: It offers a moisturizer that protects your lips from becoming dry and developing cracks. It is also used in lip-balm, lip-gloss, etc¹⁰.



Fig 4: White beeswax

2. Liquid Paraffin

Liquid paraffin, also known as Paraffinum liquidum or Russian mineral oil, is a very highly refined mineral oil used in cosmetics and medicine. Cosmetic or medicinal liquid paraffin should not be confused with the paraffin (or kerosene) used as a fuel. It is a transparent, colourless, nearly odourless, and oily liquid that is composed of saturated hydrocarbons derived from petroleum.



Fig 5: Liquid paraffin

3. Borax

Borax is used in lotions and creams. Borax is combined with wax to improve the consistency of lotions and creams. It also works as an emulsifier when used with wax and it is mostly used in hand soaps. It is excellent ingredient used for cleaning as it's alkaline in nature¹¹.



Fig 6: Borax

Orange Peel Oil

Synonyms: Hesperidium

Biological source: oils extracted from dried peels of *Citrus sinensis*.

Family: Rutaceae

Chemical constituents: Orange peel contains several chemical constituents, including D-Limonene, monoterpene alkenes, oxygenated monoterpenes, alcohol aldehydes and esters, sesquiterpenes, linear alkanes, and aldehydes. It also contains cellulose, hemicellulose, lignin, pectin, chlorophyll pigments, and other low-molecular weight compounds. It is also rich in polyphenolic compounds, including phenolic acids, flavonoids, and their derivatives.

Therapeutic uses: The essential oil components have insecticidal activities against various insect species and have been found to be advantageous against numerous diseases. Orange peel oil can be used for cleaning supplies, beauty treatments, and aromatherapy. It can be used to strengthen and thicken the outer layer of the skin, smooth out fine lines and wrinkles, and minimize dryness and flakiness of the skin. It also helps boost protein regeneration, as well as collagen and elastin synthesis¹².



Fig 7: Orange peel oil

4. Aloe Vera Gel

Synonym: Acemannan

Biological source: Dried juice collected by incision, from the bases of the leaves of various species of *Aloe barbadensis* Miller, *Aloe ferox* Miller etc.

Family: Liliaceae

Chemical constituents: The most important constituents of Aloes are the three isomers of Aloins, Barbaloin, β -barbaloin and Isobarbaloin, which constitute the so-called 'crystalline' Aloin, present in the drug at from 10 to 30%. Other constituents are amorphous Aloin, resin, emodin and Aloe-emodin. Barbaloin is present in all the varieties; it is slightly yellow coloured, bitter, water soluble, crystalline glycoside¹³. Isobarbaloin is a crystalline substance, present in Curacao aloe and in trace amount in Cape aloe and absent in Socotrine and Zanzibar aloe. The chief constituents of Socotrine and Zanzibar aloe are Barbaloin and β -Barbaloin.

Therapeutic uses: It is a natural moisturizer and a solution to many skin problems including tan lines. Several beneficial effects of aloe vera include immunomodulatory, wound and bum healing, hypoglycaemic, anticancer, gastro-intestinal antifungal, and anti-inflammatory property. Aloe vera is known for its antibacterial, antifungal, and antiviral properties. Aloe vera is often referred to as a cosmetic used to treat sunburn. Additionally, it may provide other health benefits, mainly due to its antioxidant properties¹⁴.



Fig 8: Aloe vera gel

5. Cinnamon Oil

Synonym: Dalchini, Ceylon Cinnamon, Cinnamon bark

Biological source: Cinnamon oil is derived from the bark or leaves of several types of trees, including the *Cinnamomum verum* tree and the *Cinnamomum cassia* tree.

Family: Lauraceae

Chemical constituents: Cinnamaldehyde is the main constituent of cinnamon bark oil. The essential oil (5 to 20 ml/kg) is composed of phenylpropane derivatives. Cinnamon oil mainly contains cinnamaldehyde (60 to

70 percent), eugenol (5 to 10 percent), benzaldehyde, cumin aldehyde and other terpenes such as phellandrene, pinene, cymene, caryophyllene. The major components were cinnamaldehyde (75.00%), cinnamyl acetate (5.00%) and caryophyllene (3.30%).
Therapeutic uses: The drug is used as aromatic stimulant, antibacterial, antifungal, antiseptic, carminative, stomachic and astringent. Commercially, it is also used as spice, condiment, in candy preparation, dentrifices and perfumery. Cinnamon oil is used in urinary infection and food technology. Recent studies revealed that the oils of fruit stalk, the phenolic and flavonoid compounds isolated from the fruit stalk and the extract from super-critical fluid extraction using carbon dioxide of cinnamon bark possessed significant antioxidant activity¹⁵.



Fig 9: Cinnamon oil

Table 1:- Role of Ingredients

SR.NO	INGREDIENTS	ROLES
01	White beeswax	Emulsifier, thickening agent
02	Liquid paraffin	Lubricating agent, alkaline agent
03	Borax	Stability
04	Orange peel oil	Anti tanning agent, skin whitening
05	Aloe vera gel	Moisturizer
06	Cinnamon oil	Preservative and Fragrance
07	Distilled water	Hydrate and refresh the skin

APPARATUS USED

Table 2:- Apparatus employed in formulation of cold cream

01	Measuring cylinder
02	Glass rod
03	Spatula
04	Beaker
05	China dish
06	Thermometer
07	Hot plate

Table 3:- Composition of cold cream

SR.NO	INGREDIENTS	QUANTITY (100 g)
01	White beeswax	20 g
02	Liquid paraffin	54 ml
03	Borax	1 g
04	Orange peel oil	5 ml
05	Aloe vera gel	13 g
06	Cinnamon oil	3 ml
07	Distilled water	4 ml

METHOD

The cold cream was prepared by using cream base that is white beeswax, liquid paraffin, borax, orange peel oil, aloe vera gel, cinnamon oil, distilled water. The cold cream is prepared by using extemporaneous method for geometric and homogenous mixing of all the excipients, orange peel oil and aloe extracts. By extemporaneous method, we have developed five batches of cold cream. All the five batches were evaluated for safety, quality and efficacy¹⁷.



Fig 11: Hotplate containing cold cream preparations



Fig 12: Mixing of the preparation

FORMULATION OF COLD CREAM: INCORPORATED WITH CITRUS SINENSIS AND ALOE BARBADENSIS MILLER

Melt beeswax in a China dish followed by liquid paraffin in a hot plate at 70°C. To this, add orange peel oil and stir it well. Also in a 100 ml beaker, borax was dissolved in water and was heated on other hot plate at 70°C. Both the unctuous and waterless phases are heated at the same temperature i.e. 70°C. Now borax result is added gradationally to the melted beeswax-oil mixture, drop by drop with constant stirring with the help of heat. Continue this process for 5 minutes. Then remove from heat. Then add a measured amount of aloe vera gel and stir vigorously until it forms a smooth cream. Then add a few drops of cinnamon oil for fragrance and stir it until it becomes cold and a semi solid mass was gain¹⁸.

Table 4:- Formulation of cold cream

SR.NO	INGREDIENTS	FORMULATIONS				
		F1	F2	F3	F4	F5
01	White bees wax	6 g	6 g	6 g	6 g	6 g
02	Liquid paraffin	16.2 ml	16.2 ml	16.2 ml	16.2 ml	16.2 ml
03	Borax	0.3 g	0.3 g	0.3 g	0.3 g	0.3 g
04	Orange peel oil	1.5 ml	2 ml	2.5 ml	3 ml	3.5 ml
05	Aloe vera gel	3.9 g	3.4 g	2.9 g	2.4 g	1.9 g
06	Cinnamon oil	0.9 ml	0.9 ml	0.9 ml	0.9 ml	0.9 ml
07	Distilled water	1.2 ml	1.2 ml	1.2 ml	1.2 ml	1.2 ml



Fig 13: Emulsion formed of cold cream

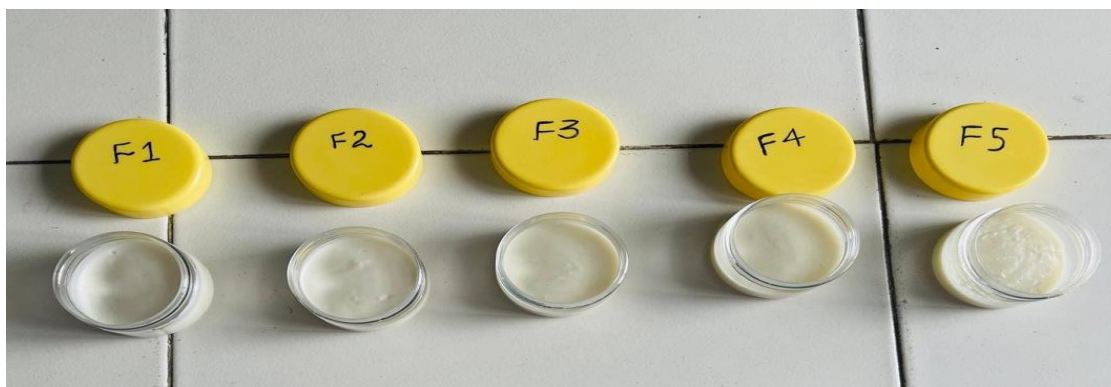


Fig 14: Formulations

**EVALUATION OF COLD CREAM:
INCORPORATED WITH CITRUS SINENSIS
AND ALOE BARBADENSIS MILLER**

1) Organoleptic Evaluation: -

The Cream was observed for nature, colour, odour, texture and appearance which were evaluated manually for its physical properties¹⁹.

Physicochemical Evaluations: -

2) Spreadability

The Spreadability was expressed in terms of time in seconds taken by two slides to slip off from the cream, placed in between the slides, under certain load (100g). Lesser the time taken for separation of the two slides, better the Spreadability. Two sets of glass slides of standard dimensions were taken. The cold cream

$$\text{Spreadability} = m \times l / t$$

formulation was placed over one of the slides. The other slide was placed on the top of the formulation, such that the cream was sandwiched between the two slides weight was placed upon the upper slides so that the cream between the two slides was pressed uniformly to form a thin layer. The upper slide allowed slipping off freely by the force of weight tied to it. The time taken for the upper slide was noted²⁰.

Where,

m = weight tied to the upper slide l = length of glass slide t = time taken in seconds

3) Phase Separation

The prepared cream was transferred in a suitable wide mouth container. Set aside for storage the oil phase and aqueous phase separation were visualizing after 24 hours²¹.

4) Irritancy test

Mark an area (1sq.cm) on the lefthand dorsal surface. The cream was applied to the specified area and time was noted. Irritancy, erythema, oedema, was checked if any for regular intervals up to 24 hrs and reported²².

5) Washability

A small amount of cream applied on hand & washed under running tap water²³.

6) pH of the cream

The pH of various formulations was determined by using digital pH meter. About 1 g of the cream was weighed and dissolved in 100 ml of distilled water. The measurement of pH of each formulation was done and average values were calculated²⁴.

7) Dye test

The scarlet red dye is mixed with the cream. Place a drop of the cream on a microscopic slide then covers it with a cover slip, and examines it under a

microscopic. If the disperse globules appear red the ground colourless. The cream is o/w type. The reverse condition occurs in w/o type cream i.e. the disperse globules appear colourless²⁵.

8) Stability

The cream shall be stable, but not to be deteriorating, ferment and segregate during normal storage conditions and usage. Stability of cream can be tested when it exposes to $40\pm 5^{\circ}\text{C}$ for a period of 15 days. After storage, no phase separation, smoothness, fine, and no change in colour and odour can be observed²⁶.

9) Dilution test

In this test type of emulsion is determined by diluting the emulsion either with water or oil. The emulsion is completely miscible with water if it is o/w type, as the dispersion medium is water and separates out if it is w/o type of emulsion. Similarly, w/o type of emulsion is miscible, if the emulsion is dissolved in oil but o/w type of emulsion is immiscible in oily liquid²⁷.

RESULTS AND DISCUSSION:**Organoleptic evaluations: -****Table 5: Physical parameters**

Sr. No	Parameters	F1C	F2C	F3C	F4C	F5C
1	Nature	Semisolid	Semisolid	Semisolid	Semisolid	Semisolid
2	Colour	Clear off White	Off white	Pale yellow	Pale yellow	Pale yellow
3	Odour	Pleasant and good acceptable	Pleasant and good acceptable	Pleasant and good acceptable	Pleasant and good acceptable	Pleasant and good acceptable
4	Texture	Fine	Fine	Fine	Fine	Fine
5	Appearance	Smooth	Grittiness	Smooth	Grittiness	Grittiness

Physicochemical evaluations: -**A. Spreadability****Table 6: Spreadability test**

Sr.No	Formulation	Time(min)	Spreadability (g cm/min)
1	F1C	5	3
2	F2C	5	1.7
3	F3C	5	1.6
4	F4C	5	2
5	F5C	5	1.8

**Fig 15: Spreadability test**

B. Phase separation

Table 7: Phase separation test

Sr. No	Formulation	Phase Separation
1	F1C	No phase separation
2	F2C	No phase separation
3	F3C	No phase separation
4	F4C	No phase separation
5	F5C	No phase separation

C. Irritancy test

Table 8: Irritancy test

Sr. No	Formulation	Irritant effect	Erythema	Oedema
1	F1C	Nil	Nil	Nil
2	F2C	Nil	Nil	Nil
3	F3C	Nil	Nil	Nil
4	F4C	Nil	Nil	Nil
5	F5C	Nil	Nil	Nil



Fig 16: Irritancy test



Fig 17: Result of irritancy test

D. Washability

Table 9: Washability test

Sr. No	Formulation	Washability
1	F1C	Easily washable
2	F2C	Easily washable
3	F3C	Easily washable
4	F4C	Not easily washable
5	F5C	Not easily washable



Fig 18: Washability test



Fig 19: Result of washability test

E. pH test

Table 11: pH test

Sr.No	Formulation	pH
1	F1C	6.8
2	F2C	6.5
3	F3C	6.1
4	F4C	5.9
5	F5C	5.7

F. Dye test

Table 12: Dye test

Sr.No	Formulation	Type of emulsion
1	F1C	w/o type emulsion
2	F2C	w/o type emulsion
3	F3C	w/o type emulsion
4	F4C	w/o type emulsion
5	F5C	w/o type emulsion

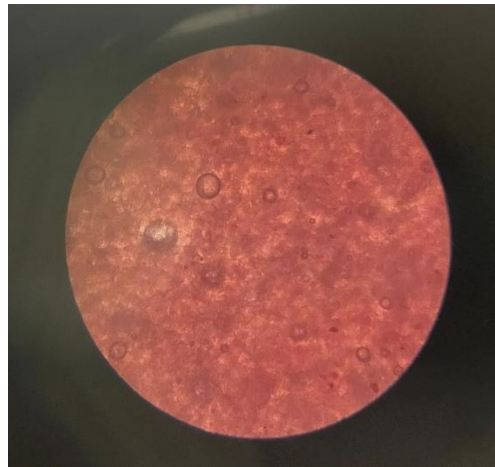


Fig 20: Result of Dye test

G. Stability test

Table 13: Stability test

Sr.No	Parameters	Room temperature	40±5°C
1	Colour	No change	No change
2	Odour	No change	No change
3	pH	6.8	6.76
4	Texture	Fine	Fine
5	Smoothness	Smooth	Smooth

H. Dilution test

I. Table 14: Dilution test

Sr.No	Formulation	Soluble
1	F1C	Insoluble
2	F2C	Insoluble
3	F3C	Insoluble
4	F4C	Insoluble
5	F5C	Insoluble

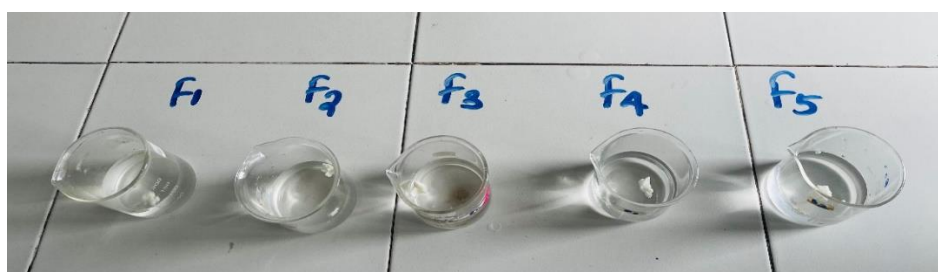


Fig 21: Result of Dilution test

CONCLUSION:

The aforementioned data revealed that the formulated cold cream developed based on *Citrus sinensis* and *Aloe barbadensis miller* have anti-tanning, skin whitening and moisturizing effect. The formulated cream demonstrated fine texture, smooth appearance and good spreadability. There were no signs of phase separation and instability problems perceived during this research period. The prepared composition was insoluble in water as it is a water in oil type emulsion. Various batches of cold cream were formulated in trials (F1C, F2C, F3C, F4C, F5C) using white beeswax, liquid paraffin, borax, distilled water and cinnamon oil. Findings of this research provide a comprehensive overview that the prepared formulation F1C was found to be better formulation than F2C, F3C, F4C and F5C. The formulated cold cream uses fewer concentration of orange oil than aloe vera in F1C as compared to other formulations, as the aloe vera provides best property of moisturizing effect that depletes the irritancy of orange oil present. The cream is made simply with simple ingredients, it is also economical. Various test results of the cream have shown that the composition can be used topically to protect the skin from damage. Based on the resultant data obtained from the different evaluation parameters it can be concluded that the prepared formulation (F1C) of cold cream incorporated with *Citrus sinensis* and *Aloe barbadensis miller* revealed that it contain anti-tanning, skin brightening and moisturizing effects.

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