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Formulation and Evaluation of antioxidant infused Cold Cream

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Abstract: In this study, a cold cream containing natural antioxidants was prepared to improve skin health and help reduce signs of aging. The cream was formulated as an oil-in-water emulsion using ingredients like beeswax, liquid paraffin and rosemary oil to provide good moisturization and smoothness. The antioxidant mixture was carefully selected to ensure it remained stable and worked well within the cream. Formulated cream was examined for different physical qualities such as pH level, uniform texture, ease of application, appearance, dye test, and stability. The observations showed that the antioxidant-enriched cold cream remained stable and effectively kept the skin moisturized, had strong antioxidant activity. The skin tests confirmed that the cream did not cause irritation or side effects, making it suitable for all skin types. Overall, this study shows that adding natural antioxidants to cold creams can improve their protective and moisturizing effects, offering both cosmetic and skin-care benefits.

Key words: Cosmetic, cold cream, skincare, antioxidant, formulation, evaluation parameters.

I. Introduction:

Under the Drugs and Cosmetics Act, 1940 (Section 3), a cosmetic is defined as any product applied to the human body such as by rubbing, spraying, pouring, or similar methods to clean the body, enhance beauty, improve appearance, or make a person look more attractive. Herbal cosmetics have a long history of use and continue to be popular today. Many people choose them because they are made from natural plant sources and are thought to be safer, with fewer unwanted effects than synthetic products. These cosmetics help protect and nourish the skin while also improving its aesthetic. Unlike chemical-based cosmetics, herbal cosmetics avoid the use of harsh artificial substances and drugs, making them a more natural and gentle choice for skincare.

Cosmetics: The branch of science that deals with the study and use of cosmetic products is called cosmetology. Cosmetics are mainly used to give a temporary improvement to one's appearance, making them suitable for daily use as well as for special events. They are products applied to the body to enhance facial appearance, add fragrance, and improve the look and feel of the skin. Most cosmetics are formulated for use on areas such as the face, hair, and body. Cosmetic products are usually made by combining different chemical substances, which may be obtained from natural sources like plant oils or created artificially in laboratories.

Cream: Creams are semi-solid products meant for application on the skin. They have a smooth and soft texture, making them easy to spread over the skin or certain mucous membranes. Creams are commonly used to protect the skin, treat skin conditions, or prevent skin-related problems. Evaluate to ointments, creams are lighter and do not usually form a heavy or greasy layer on the skin. Creams have a softer consistency than ointments and feel less oily. They are prepared by mixing one or more active or medicinal ingredients into a suitable base. The active substances may be dissolved or suspended in bases that can be easily washed off with water or that provide a moisturizing effect. Depending on their formulation, creams may use water-loving (hydrophilic) or oil-loving (hydrophobic) bases, so they blend well with the skin's natural oils. Because creams are manufactured using methods like pharmaceutical preparations, they are often considered pharmaceutical products. Based on their function, creams can be cosmetic or therapeutic.

Creams are available in different types, including ayurvedic, herbal, and allopathic formulations, and people choose them according to their skin type and needs. In general, creams are classified into, oil-in-water creams and water-in-oil creams.

Oil-in-Water (O/W) type cream: Oil-in-water (O/W) creams, such as lotions and light moisturizers, feature a continuous base of water with scattered oil droplets. They feel light and hydrate rapidly. These creams are made up of microscopic oil droplets dispersed over an aqueous phase that is continuous. An oil-in-water biphasic is

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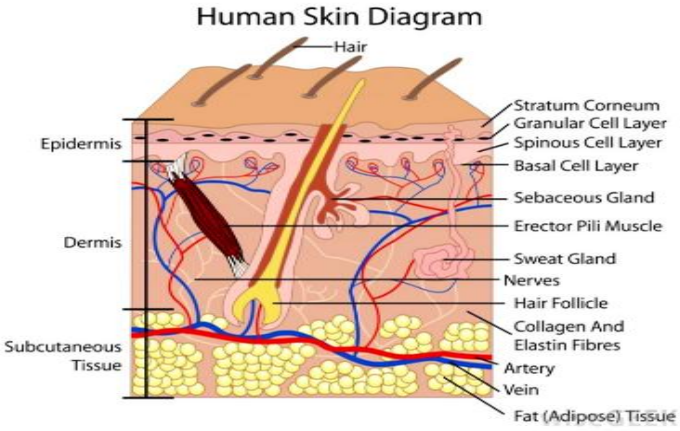
one in which the dispersed phase is distributed throughout the aqueous phase as droplets. **Water-in-oil (W/O) cream:** They kind feel heavier, more occlusive, and offer intense, long-lasting moisture and protection. They are comprised of oil as the continuous phase with distributed water droplets (richer creams, barrier creams). These creams are made up of tiny water droplets dispersed throughout an oily phase. Water as the dispersed phase and oil as the dispersed phase define a water-in-oil emulsion.

Skin anatomy and physiology: The skin is the body's biggest organ. It is made up of water, proteins, lipids, and minerals and is crucial for shielding the body from dangerous microbes. In addition to having nerve endings that enable us to experience touch, pain, heat, and cold, the skin also aids in controlling body temperature. The skin is composed of three primary layers. The epidermis, the outermost layer, serves as a barrier for protection. Beneath it is the dermis, which has glands, blood vessels, and nerves in addition to giving it strength and suppleness. The hypodermis, the innermost layer of skin, is primarily made up of connective tissue and fat and serves as insulation.



Antioxidant: Anti-oxidative agent in creams are substances that help shield the skin from harmful free radicals produced by sunlight, pollution, and daily stress. They protect skin cells from damage, which helps keep the skin healthy and youthful. By reducing oxidative stress, antioxidants slow down early signs of aging such as wrinkles and fine lines. They also support skin repair, enhance natural glow, and help maintain a smooth and even skin tone.

Various type of antioxidant:

1. Dietary antioxidant
2. Synthetic antioxidant
3. Natural antioxidant
4. Endogenous antioxidant
5. Exogenous antioxidant

Dietary antioxidant: Dietary antioxidants come from food sources. These include vitamins such as vitamin C and vitamin E found in citrus fruits, strawberries, tomatoes, green vegetables, plant oils, and avocados. Minerals like copper, iron, and selenium are found in poultry, seafood, legumes, and fortified grains. Carotenoids they are *α-carotene*,*β-carotene*, β-*cryptoxanthin*and lycopene are present in foods like pumpkin, papaya, carrot, spinach, and red pepper.

Synthetic antioxidant: Synthetic antioxidants are man-made substances created to prevent or slow oxidation in products like foods, cosmetics, and industrial materials. They perform functions like natural antioxidants but are produced in laboratories to improve product stability, effectiveness, and shelf life.Based on how they work, synthetic antioxidants are divided into free-radical scavenger and free-radical inhibitor

Natural antioxidant: Natural antioxidants are substances that occur naturally, mainly in plants, but they are also present in some animals and microorganisms. Unlike synthetic antioxidants, they are not made in laboratories. Their main function is to protect the body by neutralizing oxidative agent that can affect the cells by oxidation. They were done by giving electrons, which stabilizes these harmful molecules.Natural antioxidants include vitamins such as vitamin C and vitamin E, plant compounds like polyphenols (for example, flavonoids and tannins), carotenoids such as beta-

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carotene and lycopene, and certain minerals like selenium and zinc. By reducing oxidative stress, these antioxidants help slow down processes like skin aging and may lower the risk of various health problems.

Endogenous antioxidants: Endogenous antioxidants in creams are antioxidants that are naturally present in the skin and are added to creams to support and replenish the skin's own defence system.They work to safeguard the skin against damage from harmful molecules that form due to sunlight, environmental pollution, and aging.

Exogenous antioxidants: Exogenous antioxidants in creams are antioxidants that are obtained from external sources (plants, vitamins, or minerals) and are added to creams to protect the skin from damage caused by free radicals from sunlight, pollution, and toxins**.**

Aim and objectives:

1. The purpose of this project is to develop and assess antioxidant cold cream prepared using orange peel powder, brown rice water and rosemary oil.
2. To perform the process for the chosen herbal ingredients.
3. To prepare a cold cream formulation incorporating orange peel powder, brown rice water and rosemary oil as key components.
4. To analyse the formulated cold cream for its antioxidant activity.
5. To evaluate the quality and performance of the cold cream through parameters such as homogeneity, washability, pH, irritation test, spreadability, and overall, after-feel.

Collection of materials:

Drug profile: Orange Peel.
Scientific Name: Citrus reticulata
Family: Rutaceae
Subfamily: Aurantioideae
Order: Sapindales
Clade: Angiosperms
Biological Source: Orange peel refers to the fresh or dried outer layer of the fruit's pericarp obtained from Citrus aurantium (bitter orange).
Benefits for Skin: Helps to safeguard the skin from damage caused by oxidative agent. Provides moisture to dry or dehydrated skin Enhances natural skin radiance and promotes a healthy glow.
Uses: Orange peel contains high levels of vitamins A and C, which act as natural antioxidants. These nutrients strengthen the immune system, support the body in fighting infections, and help prevent colds and flu. The peel also has plant nutrients and polyphenolic compounds than the fruit pulp, giving it strong anti-inflammatory properties.

Drug profile: Brown rice water
Scientific name: Oryza sativa
Family: Poaceae
Subfamily: Oryzoideae
Other names: Asian rice, paddyrice
Biological source of brown rice water:Brown rice is obtained from the whole unpolished grains of oryzasativa (Asian rice) belonging to the family poaceae it is produced by removing only the outer husk of the rice grains while keeping the bran layer and germ intact these layers give brown rice its natural colour, higher nutrient content and characteristic texture.
Uses: Helps in weight management due to its high fibre content, which promotes fullness, Helps regulate blood sugar levels, making it beneficial for people with diabetes, used in the production of health supplements, baby foods, and whole-grain snack.

Drug profile: Rosemary oil
Biological Source: Salvia rosmarinus
Family: Lamiaceae

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Habitat: Rosemary is native to the Mediterranean basin and is also found naturally in regions such as Portugal and northwestern Spain.
Uses: It helps improve blood circulation, reduce acne, and delay signs of aging due to its antioxidant properties.

Excipients used:
Borax:
IUPAC Name: Sodium tetraborate decahydrate
Molecular Formula: $B_4H_{20}Na_2O_{17}$
Synonyms: Sodium borate, Sodium diborate, Sodium metaborate, Komex, Disodium borate heptahydrate, Disodium borate monohydrate, Monosodium metaborate
Uses: Borax acts mainly as an emulsifier and stabilizing agent in cosmetic formulations. It helps prevent microbial growth, maintains pH stability, and protects products from spoilage
Bees wax:
IUPAC Name: Triacontanyl palmitate
Synonyms: Yellow beeswax, Cera alba, Rodex
Molecular Formula: $C_{15}H_{31}COOC_{30}H_{61}$
Uses: Beeswax helps improve skin elasticity because of its naturally flexible structure. It also exhibits anti-allergic, anti-inflammatory, antioxidant and antibacterialproperties.
Liquid paraffin: IUPAC Name: 2-(3,4,5-trihydroxyphenyl) chromenylium-3,5,7-triol; chloride (as provided)
Molecular Formula: $C_{15}H_{11}ClO_7$
Synonyms: Paraffinumliquidum, paraffin oil, liquid paraffin oil, Russian mineral oil.
Uses: Liquid paraffin is widely used in skincare formulations because it helps retain moisture by forming a protective film over the skin. This barrier reduces water loss, providing the skin soft and hydrated. It also shows an emollient, improving smoothness and overall skin feel.

Formulation:

INGREDIENTS	QUANTITY 10 gram	
	F1	F2
ORANGE PEEL POWDER	1.5 gm	1.4gm
BROWN RICE WATER	0.3ml	0.2ml
ROSEMARY OIL	0.8ml	0.5ml
BEES WAX	3.5gm	3.2gm
LIQUID PARAFFIN	8ml	10ml
BORAX	0.15gm	0.16gm
METHYL PARABIN	0.03gm	0.04gm
WATER	q.s	q.s

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Procedure:

1. The water in oil type of cream was prepared by using 2 phases
2. All the ingredients and the excipients were measured correctly and accurately
3. The oil phase should be prepared by melting the bees wax along with that liquid paraffin and rosemary oil extract by maintaining them in 70^0C temperature
4. Then the aqueous phase was prepared by heating borax, methyl paraben orange peel powder and brown rice water with sufficient water by maintaining 70^0 C temperature
5. Aqueous phase was gradually introduced into the oil phase while continuous stirring until the cream consistency is achieved
6. Rosemary oil that acts as a perfume for formulation
7. The cream was stirred well and packed then stored in well closed container.

Evaluation parameters:

1.PHYSICAL APPEARANCE: The physical appearance of the cream can be observed by its colour, roughness and was graded.

The cream formulation is smooth and well acceptable flavour it makes the cosmetic formulation

FORMULATION (F)	APPEARANCE	COLOUR	ODOUR	TEXTURE
F1	Clear	Buff colour	Aromatic	Smooth
F2	Clear	Buff colour	Aromatic	Smooth

2. HOMOGENEITY:

The cream formulation was tested for the homogeneity by visual appearance and by touch
This formulation was confirmed that visual appearance and touch was good.

3. WASHABILITY:

Washability test was caried out by applying small amount of cream on slide.
Then wash with tap water the observation is as follows

FORMULATION(F)	WASHABILITY
F1	Easily washable
F2	Easily washable

4. AFTER FEEL:

Emollience, slipperiness and amount of residue left after the application of fixed amount of cream is checked.
The cream was applied to ascertain whether its Greasy or not

FORMULATION (F)	RESULT
F1	Non greasy
F2	Greasy

5. PH MEASUREMENT:

The PH meter was calibrated by the standard buffer solution.
About 0.5 gm of cream was weighted and then dissolved in 50 ml of distilled water

The formulation was measured by using digital PH meter

FORMULATION (F)	PH			AVERAGE PH
	TRIAL 1	TRIAL 2	TRIAL 3	
F1	6.81	6.75	6.85	6.80

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F2	6.79	6.81	6.83	6.81

Average pH of the cream formulation ranges from 6.75 to 6.85.

6. DYETEST:

The Amarnath dye is mixed with the cream. A drop of the cream is placed under the microscope slide and then covered with coverslip and examine under the microscope.

If the dispersed globules appeared, then the cream is water-in-oil (w\o) type.

If the dispersed globules appear colourless then the cream is oil-in-water(o\w) type.

7. SPREADABILITY TEST:

The amount of sample is taken between two glass slide and weight 10 gm applied on the slide for 5 mins.

Spread ability can be expressed by S=**m*l\t**

The spreadability for the formulation was calculated. The spreadability value for the formulation was found to be in the range 51-61 g.cm\5min.

FORMULATION (F)	SPREADABILITY (g.cm/5min)			AVERAGE SPREADABILITY
	TRIAL 1	TRIAL 2	TRIAL 3	
F1	59	61	59	59.66
F2	57	51	57	55

8.ACID VALUE:

A 10 gm of sample was dissolved in 50ml mixture of equal volume of alcohol and solvent ether. The flask was connected to flux condenser and slowly heated until the sample dissolved completely. Then, 1ml of phenolphthalein was added, and the solution was titrated with 0.1N NaOH until the faint pink colour appeared after shaking for 30 seconds.

Acid value= n*5.61/w

The acid value of formulated cream was found to be in satisfactorily values. Acid value is defined as the number of milligrams of NaOH required to neutralize in oil or fat. It indicates the amount of free fatty acid present in sample.

If no fatty acid is present, the oil or fat is good quality. If more fatty acid is present, it indicates the fat, or oil has become rancid (hydrolysis of oil or fat).

The result of acid value of formulated cream:

FORMULATION (F)	ACID VALUE (mgNaOH\g)
F1	3.04
F2	2.94

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9.SAPONIFICATION VALUE:

Saponification value for the formulated creams was found to be in satisfactorily values. Saponification value is the number of milligrams of potassium hydroxide (KOH) or sodium hydroxide (NaOH) required to saponify one gram of fat under the condition specified.

The 2gm of the substance were refluxed with 25ml of 0.5 N alcoholic KOH for 30 minutes. To this mixture, 1ml of phenolphthalein was added and the titrated immediately with 0.5N HCL. Note the readings 'a'. Repeat the operation, and the substance being examined and note the reading as 'b'.

Saponification value= (b-a) *28.05/w

Were,

W= weight of the substance in grams.

A= volume of litre in ml

B= Represents volume of blank in ml.

It measures the average molecular weight of all fatty acids present in form of triglycerides. The higher the saponification value, the lower the fatty acid average length, the lighter the mean molecular weight of triglycerides and vice versa.

The saponification value of cream formulation is given in below table.

FORMULATION(F)	SAPONIFICATIONVALUE (KOH\g)
F1	148.69
F2	135.25

II. Conclusion:

This research concludes that the antioxidant-infused cold cream was successfully formulated and evaluated, demonstrating its potential as an effective skincare preparation. The inclusion of antioxidant agents significantly enhanced the functional value of the cold cream by providing protection against oxidative stress while maintaining the primary role of moisturizing and nourishing the skin. The formulation shows that appropriate pH, smooth texture, good spreadability, and homogeneity, indicating user acceptability and formulation stability. Stability assessment confirmed that the cream remained consistent in quality without noticeable changes during the study period. Overall, the antioxidant-infused cold cream can be considered a safe, stable, and beneficial cosmetic product, with potential application in daily skincare routines to improve skin protection and overall skin health.

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