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FORMULATION EVALUATION AND DEVELOPMENT OF NATURAL ANTI-ACNE SERUM USING CINNAMON AND CALENDULA OFFICINALIS

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Abstract:
The level of active ingredients is higher than in a usual face cream, since the heavier oils and ingredients have been done away with. So while the latter could have around ten per cent of active ingredients, the former has a whopping seventy per cent or more! Serum is a skincare product you can apply to your skin after cleansing but before moisturizing with the intent of delivering powerful ingredients directly into the skin. Serum is particularly suited to this task because it is made up of smaller molecules that can penetrate deeply into the skin and deliver a very high concentration of active ingredients. This makes them a great tool for targeting specific skincare concerns, like wrinkles. There is urgent need for Serum production and from local raw materials in order to supplement the existing ones. I recommend more research to be carried out on extraction of Cinnamon and Calendula officinalis essential oil and its formulation from vast variety of oil bearing plants in our ecosystem.

Keywords: *Anti-acne Serum, Cinnamon, Calendula officinalis, flavonoids*

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INTRODUCTION:

Serum is a skincare product you can apply to your skin after cleansing but before moisturizing with the intent of delivering powerful ingredients directly into the skin. Serum is particularly suited to this task because it is made up of smaller molecules that can penetrate deeply into the skin and deliver a very high concentration of active ingredients.

Skin:

Skin is the largest sensory and contact organ in the human body. Its surface area in adults is approximately 1.5-2 m the human skin consists of two main layers, namely the epidermis and dermis. Underneath the dermis, there is a third layer, called the hypodermis, which consist mainly of fat cells and is not considered component of the skin. The skin is a complex organ made up of dead cells, epithelium, connective tissue, muscles, nerves, blood vessels, as well as the so called appendages, including the nails, hair, and glands, such as sebaceous glands, eccrine and apocrine sweat glands.

Epidermis is the outer layer of the skin that functions as a protective layer against external influences. It is composed of five main layer, stratum corneum , is made up of dead cells that continuously shed and are replaced by cells in the adjacent layer. This layer is very thick compared to the others; it contains 15-30 layers of dead cells. Stratum luciddum, the translucent or clear layer, contains 3-5 rows of densely packed flat dead cells. Stratum granulosum, the granulosum layer, consist of 3-5 layers of flattened keratinocytes that begin to die. In this layer, granules can be observed in the cells. Stratum spinosum, the prickle cells layers, contains 8-10 rows of cells. This layer is responsible for lipid and protein synthesis. Stratum basal is made up of a single layers of cells. Dermis is located under the epidermis, and it functions as a supporting frame to the epidermis, supplying it with nutrients and oxygen via the blood capillary.

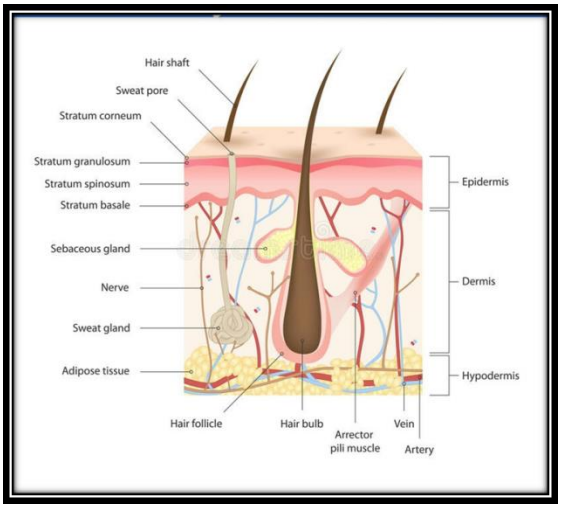


FIG. NO 1: STRUCTURE OF SKIN

Acne:

Acne could even be a multifactorial chronic disease of pilosebaceous units. Propionibacterium acnes and staphylococcus epidermidis are considered because of the foremost skin bacteria that cause the formation of acne. Acne is that the most typical reasonably skin condition.It's most widespread among older, children, teenagers, and adults. Around 80% of 11 to 30-year-olds are ill with acne. Most acne cases in girls occur between the ages of 14 to 17 and in boys, the condition is commonest in 16 to 19 years old. Herbal Anti-acne cream was prepared using extracts of the plants Aegle marmelos. The plant has been reported within the literature having good anti-microbial, anti-oxidant, anti-bacterial, and anti-inflammatory activity. Acne is believed to be caused by changes in hormones that are triggered during puberty. Acne can cause great distress and harm a person's quality of life and self-esteem. Acne is additionally called acne could even be a protracted run disease of the skin that happens when hair follicles are blocked with dead skin cells and oil from the skin. it's characterized by blackheads or whiteheads, pimples, oily skin, and possible scarring. If primarily affect the world of the skin with a comparatively high number of oil glands including the face, upper part of the chest, and back. The resulting appearance may find yourself in anxiety, reduced self-esteem [21]

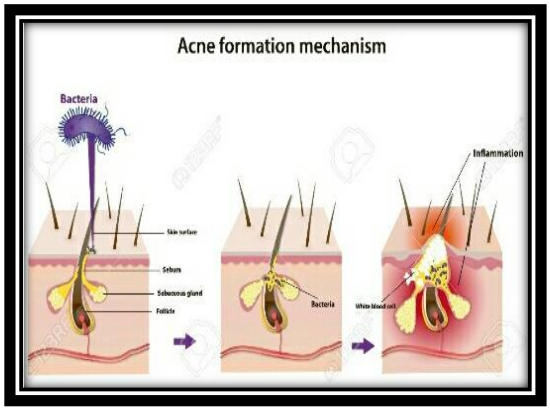


FIG NO 2: MECHANISM ACTION OF ACNE

Three pathogenic factors are closely involved in the mechanism of acne with a sequence beginning with seborrhea, then sebum retention, and finally inflammation. The sebaceous gland is a target of androgens. Acne may be related to an excessive sensitivity of sebaceous end-organs to androgens. However, in women, an ovarian or adrenal hyperandrogenism may be implicated. The cause of sebum retention is the hyperkeratinisation of the infra infundibulum of the sebaceous duct. Many factors, particularly the chemical composition of sebum in acne and the androgens are responsible for this hyperkeratinisation. The inflammation is related to the inflammatory role of the numerous enzymes of Propionibacterium acnes and to the chimiotactism of neutrophils.

Active profile:

Cinnamon:

Cinnamon is a spice obtained from the inner bark of several tree species from the genus Cinnamomum. Cinnamon is used mainly as an aromatic condiment and flavouring additive in a wide variety of cuisines, sweet and savoury dishes, breakfast cereals, snack foods, bagels, teas, hot chocolate and traditional foods. The aroma and flavour of cinnamon derive from its essential oil and principal component, cinnamaldehyde, as well as numerous other constituents including eugenol.

Biological Source

Cinnamomum zeylanicum, the source of cinnamon bark and leaf oils, is an indigenous tree of Sri Lanka, although most oil now comes from cultivated areas. C. zeylanicum is an important spice and aromatic crop having wide applications in flavoring, perfumery, beverages, and medicines Cinnamon consist of dried bark, freed from the outer cork and from the underlying parenchyma, from the shoots growing on the cut stumps of ***Cinnamomum zeylanicum Nees.*** **Family:–** ***Lauraceae.***



FIG.NO. 3: ***CINNAMOMUM ZEYLANICUM NEES***

Chemical Constituents:

Cinnamon contains about 10% of volatile oil, tannin, mucilage, calcium oxalate and sugar. Volatile oil contains 50 to 65% cinnamic aldehyde, along with 5 to 10% eugenol, terpene hydrocarbons and small quantities of ketones and alcohol

Uses:
It is used as an alterative, aromatic, carminative, flavouring agent, analgesic, antiseptic, antirheumatic, antispasmodic, demulcent, digestive, expectorant, stomachic, diaphoretic, antibacterial, antifungal, etc. It stops vomiting, relieves flatulence and is given with chalk and as astringents for diarrhoea and haemorrhage of the womb. It is also used in the treatment of bronchitis, colds, palpitations, nausea, congestion, and liver problems.

Calendula officinalis:

Biological Source:
Calendula officinalis* Family: *Asteraceae:
Calendula officinalis, the pot marigold, common marigold, ruddles, Mary's gold or Scotch marigold is a flowering plant in the daisy family Asteraceae. It is probably native to southern Europe, though its long history of cultivation makes its precise origin unknown, and it may possibly be of garden origin.[clarification needed] It is also widely naturalised farther north in Europe (as far as southern England) and elsewhere in warm temperate regions of the world



FIG. NO 4: *CALENDULA OFFICINALIS*

Chemical constituent:
The petals and pollen of Calendula officinalis contain triterpenoid esters and the carotenoids flavoxanthin and auroxanthin (antioxidants and the source of the yellow-orange coloration). The leaves and stems contain other carotenoids, mostly lutein (80%), zeaxanthin (5%), and beta-carotene. Plant extracts are also widely used by cosmetics, presumably due to presence of compounds such as saponins, resins, and essential oils.[14]
The flowers of Calendula officinalis contain flavonol glycosides, triterpene oligoglycosides, oleanane-type triterpene glycosides, saponins, and a sesquiterpene glucoside.[15][16] Calendula flowers are a rich source of lutein, containing 29.8 mg/100g

Uses of Calendula officinalis:

Calendula oil is natural oil extracted from marigold flowers (Calendula officinalis). It's often used as a complementary or alternative treatment.
Calendula oil has antifungal, anti-inflammatory, and antibacterial properties that might make it useful in healing wounds, soothing eczema, and relieving diaper rash. It's also used as an antiseptic.

MATERIAL AND METHODOLOGY:

A proper method has to be carried out while formulating the Serum Using Cinnamon and Calendula officinalis Selection of actives are as,

- **Collection and Authentication**
- **Selection of base**
- **Formulation**
- **Preparation**
- **Evaluation**

Formulation of Active Herbs

TABLE NO 01: FORMULATION OF ACTIVE HERBS

Sr no.	Ingredients	Quantity for 100%
1.	Glycerine	5%
2.	Propylene glycol	5%
3.	Xanthum gum	0.5%
4.	Sodium EDTA	0.2%
5.	Allantion	0.1%
6.	DMDM Hydentoin	0.15%
7.	Active	10%
8.	Water	79.05%

TABLE NO 02: FORMULATION OF BASE

Sr no.	Ingredients	Quantity for 100%
1.	Glycerine	5%
2.	Propylene glycol	5%
3.	Xanthum gum	0.5%
4.	Sodium EDTA	0.2%
5.	Allantion	0.1%
6.	DMDM Hydentoin	0.15%
7.	Active	10%
8.	Water	79.05%

EXPERIMENTAL WORK:

Extraction of Calendula officinalis From Petals Use in Vacuum distillation

Procedure



FIG. NO 5: EXTRACTION OF CALENDULA OFFICINALIS

Extraction of Cinnamon From Bark Use in Soxhlet extraction
Procedure

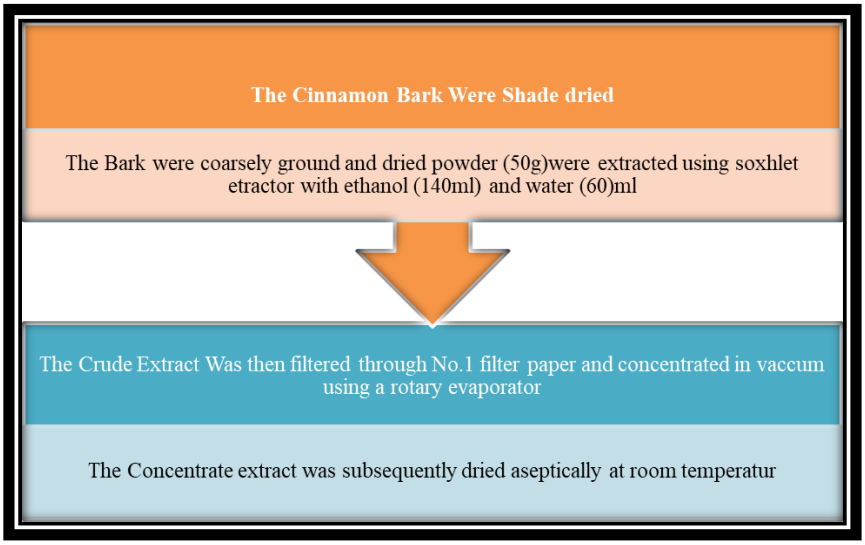


FIG. NO.6: EXTRACTION CINNAMON BARK

Preparation of Serum:
Procedure:
All the ingredients were weighed according to the different percentage listed (Table). The net weightof all formulated serum was 100g. Add water and EDTA into a disinfected glass beaker and stir, until EDTA has dissolved. Add hyaluronic acid and mix thoroughly with a stick blender or homogenizer until phase A is free of lumps. Add phase B to phase A, stir well after each ingredient has been added. Mix with stick blender. Add phase C to phase A/B, again, stirring well after each ingredient. Especially after sodium acrylate uses the stick blender. Serum should be free of any lumps. Viscosity can be adjusted by adding, 2.5% of the sodium acrylate, if needed.
Phytochemical screening:

The concentrated extracts of selected plant was subjected to different chemical tests for the detection of different phytoconstituents using standard methods

(i)Test for saponins

Crude extract when mixed with 5ml distilled water in a test tube then it was shaken briskly. The formation of stable foam which indicate the presence of saponins.

(ii) Test for flavonoids

Crude extract when mixed with 10ml distilled water, 5ml of dilute ammonia solution were added to a portion of the aqueous filtrate solution then added 1ml concentrated sulphuric acid. Indication of yellow color shows the presence of flavanoids.

(iii) Test for steroids

The crude extract of selected plant was dissolved in 0.5mL dichloromethane to prepare a dilute solution and then 0.5 mL of acetic anhydride was added followed by four drops of concentrated sulphuric acid. A blue-green colouration indicated the presence of steroids.

(iv) Test for tannins

Curde extract of plant was mixed with small amount of water and heated on water bath. The mixture was filtered and ferric chloride was added drop by drop to the filtrate. A dark green appear which indicates the presence of tannins.

(v) Test for Alkaloids

Curde extract was dissolved with 2ml of 1% HCl and heated gently. Wagners and Mayers reagents were added to the mixture. Turbidity of the resulting precipitate was taken as confirmation for the presence of alkaloids.

(vi) Test for carbohydrate

Both Felhing A and Felhing B solution were mixed in equal volume. These reagent are added in crude extract and smoothly boiled. A brick red precipitate is appeared at the bottom of the test tube and indicate the presence of reducing sugar

Microbial Assay:

A microorganism occurs nearly anywhere in nature. They are carried by air currents from yhe earth's surface to the upper atmosphere. They occur most abundantly where they find food, moisture and temperature suitable for their growth and multiplication. They can be found on the surface of our bodies, in our mouth and on feet.

Fortunately, most organisms are harmless to us; and we have ways of resisting in various by those are potentially harmful.

Microbiological assay is important, as one of the cause for formation of acne, bad breath and athlete's foot is presence of bacteria on the skin surface and make the condition worse.

TABLE NO. 03: DIAMETER OF ZONE OF INHIBITION OF CINNAMON AND CALENDULA OFFICINALIS EXTRACT

Microorganism	Diameter of zone of inhibition in(mm)	
	ethanol extract	
	1500mg/ml	2000mg/ml
Propionibacterium acnes.	14mm	15mm

In vivo studies:

Patch test:

Patch test was performed on sensitive part of skin, e.g. blend of elbow, popliteal space of skin behind ears. The cosmetic was tested by applying to an area of 1 sq.cm of the skin. Central patches were also applied. The site of the patch was inspected after 24 hours. There was no reactions and then test was repeated once more on the same side. Since there was no reaction as the person was considered as not hyper sensitive and product pass the test.

RESULT AND DISCUSSION:

Evaluation parameters:

TABLE NO 04: EVALUATION PARAMETER OF ANTI- ACNE SERUM

Sr.no	Parameters	Observation
1	Color	Colourless
2	Odor	Aromatic
3	Consistency	Good
4	pH	pH 5.2
5	Viscosity	293.15-343.15*
6	Irritability	Non-irritant

Preliminary phytochemical analysis of Bark of Cinnamon

TABLE.NO 05: PRELIMINARY PHYTOCHEMICAL ANALYSIS OF BARK OF CINNAMON

Phytochemical Constituents	Bark Extract		
	Ethanol	Chloroform	Hexane
Alkaloids	+	+	-
Flavonoids	+	+	+
Terpenoids	+	+	-
Tannins	-	+	-
Saponins	+	-	-
Carbohydrate	+	+	-

+ = indicates presence of phytochemicals, - = indicates absence of phytochemicals

Preliminary phytochemical analysis of Calendula officinalis

TABLE. NO 06: PRELIMINARY PHYTOCHEMICAL ANALYSIS OF CALENDULA OFFICINALIS

Sr.No	Chemical constituents	Calendula officinalis
1	Resin	-
2	Tannins	+
3	Anthraquinones	-
4	Trepenoids	+
5	Flavonoids	+
6	Alkaloids	-
7	Carbohydrates	+
8	Saponin	-

+ = indicates presence of phytochemicals, - = indicates absence of phytochemicals

Patch Test of Serum

TABLE NO.07: PATCH TEST OF SERUM

Sr.no.	Parameter	M1	M2	M3
1	Immediately after removal of product	N.R.	N.R.	N.R
2	After 24 hrs	N.R.	N.R.	N.R
3	After 48 hrs	N.R.	N.R	N.R

CONCLUSION:

From above discussion it is concluded that Cinnamon and Calendula officinalis Extract had antimicrobial property against Propionibacterium acnes. From the above experimental work, the Cinnamon and Calendula officinalis Extract showing good activity against Propionibacterium acnes.

Finally it was concluded that extract of Cinnamon and Calendula officinalis shows antibacterial activity against selected microorganism with increase in concentration the activity is increase therefore it can be incorporated in cosmetics products.

Vacuum distillation, Soxhletion and hydrodistillation methods are effective and efficient means of extracting Serum. Extraction is the most common and most economically technique for extracting Natural oil in modern Herbal industry because of its simplicity.

There is high demand for essential oils for various purposes such as medicinal, perfumery, aromatherapy, cosmetic, soap making, insectides to mention but a few. Imported essential oils are very expensive to meet the demand of our local consumer industries, therefore it becomes necessary to source and synthesis these oils from local sources, in particular..

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