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Research Article

Development And Evaluation Of Cyperus Rotundus Based Hair Removal Cream

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ABSTRACT

The market for hair removal products in the cosmetics and personal care sectors is expanding. Unwanted hair development is a common issue for teenage girls and women. Because of their great efficacy, safety, and lack of negative side effects, herbal depilatories are a better option than pharmaceutical ones, as this study emphasizes. Other hair removal techniques are reviewed, along with the content of herbal lotions containing depilatory herbs. Cosmetic products called depilatories are designed to remove hair from the skin. The active ingredients in most chemical depilators are thioglycolic acid salts. Thioglycolic acid, cetyl alcohol, Cyperus rotundus oil, calcium hydroxide, vitamin E, bees wax, liquid paraffin, and the required amount of orange oil are needed to make the hair removal cream. The formulation of the hair removal cream was assessed for ph and viscosity. The outcomes highlighted the exceptional qualities of the F3 formulation.

INTRODUCTION

Hair

The unique, thread-like protrusions of the epidermis that make up an animal's coat, or pelage, are called hair and are only seen on mammals. To varied degrees, all mammals have hair. Mature whales, elephants, sirenians, and rhinoceroses only have scant bristles for body hair. The bulk of other mammals have enough hair to form thick coats, yet humans are among the mammals with the least amount of hair. Humans have a variety of various hair kinds. The lanugo, a coating of livery, is the first to mature. Every aspect of the body is covered in vellus, with the exception of a few spots, including the undersides of the fingers and toes, the soles of the feet, and the palms of the hands. The hairs on the scalp, brows, and eyelashes differ from these other types and begin to grow quite early in childhood. The average scalp has between 100,000 and 150,000 hairs, which is where hair is

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often densest and longest. About 0.5 inches (13 mm) of human hair grow each month.[1]

The Anatomy of The Scalp:

In the follicle, hair grows. At the junction of the deep dermis and hypodermis is the bulb. The blood flow and supply of vitamins, minerals, and amino acids to the hair are ensured by a tiny blood vessel that enters the hair shaft. The sweat produced by the sweat glands is eliminated by the pores on the scalp's surface [2]. The arrector pili, a little muscle, connects each hair follicle to the skin. The hair stands up straight and the skin creates a goosebump as it contracts. [3]

1. The skin
2. Connective tissue layer
3. Galea aponeurotica
4. Loose areolar connective tissue
5. The pericranium [4].

Structure of Hair:

A keratinous filament known as hair grows from the epidermis. It generally consists of keratinized, dead cells. The hair follicle, an epidermal penetration of the dermis, is where hair strands are born. The portion of the hair shaft that is not attached to the follicle is largely exposed at the skin's surface. The remainder of the hair, which is rooted in the follicle, is referred to as the hair root and is located underneath the skin's surface. The hair bulb surrounds the hair papilla, which is made of tissue and contains blood capillaries and nerve endings from the dermis (figure1).

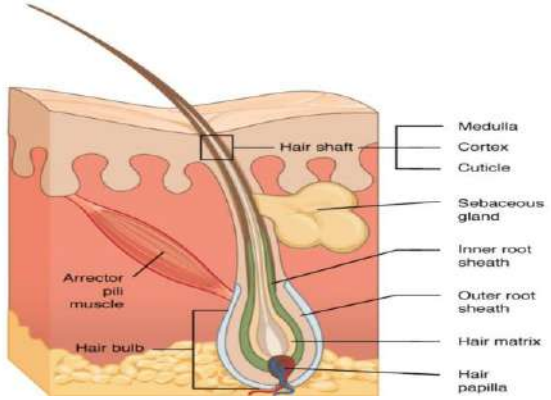


Figure1: hair follicles originate in the epidermis and have many different parts [6].

The basal cells of the hair bulb produce keratinocytes to initiate hair development. The hair shaft is forced through the follicle and out toward the surface when new cells are deposited at the hair bulb. The majority of chemical hair removers also only remove hair on the surface; however, electrolysis and pulling also make an effort to kill the hair bulb so that hair cannot regenerated. Hair serves a variety of functions, including protection, sensory input, thermoregulation [5].

The Hair Shaft:

The section of a hair that is visible above the scalp is called a hair shaft. Keratin, a protein, is compressed and bonded together to create it. The protein keratin is exceptionally tough and resistant to deterioration. Disulfide bonds and hydrogen bonds, two different types of bonding, hold it all together.

The Hair Bulb:

Every hair originates from a distinct hair follicle. At the base of each hair follicle is a hair bulb that contains hair cells that are actively growing. These continue to split and push upward, getting harder over time. There are the three core layers of the hair the cuticle, cortex, and medulla. Certain cells in the hair bulb known as melanocytes produce the pigment called melanin, which gives hair its colour [7].

The Hair Growth Cycle:

The hair growth cycle is made up of three phases: anagen, catagen and telogen.

A. The Anagen phase:

The active stage of hair development is another name for the anagen phase. Hair grows at an average rate of 1 centimetre every 28 days throughout the anagen phase, which lasts between 2 and 8 years.

B. The catagen phase:

the catagen phase, which lasts for 2 to 4 weeks and is characterized by transitional phase in the hair, comes completely deteriorated by this point.

C. The telogen phase:

the final phase, telogen, is additionally known as the resting stage. This phase, which lasts for 2-4 months, marks the beginning of hair shedding. Hair either falls out on its own or is pulled out during this time. [8].

Figure2: Stages of Hair Growth

Body hair:

Body hair, also known as androgenic hair, is a type of terminal hair that appears on people during and after puberty. It's distinct from head hair and also from vellus hair, which is less noticeable and much finer and lighter in colour. The quantity of androgens (male hormones) and the density of androgen receptors in the dermal papillae are associated to the growth of androgenic hair. Lips, backs of ears, palms of hands, soles of feet, some external genital parts, navel, and scar tissue are examples of exceptions. Individual differences exist in hair density, or the number of hair follicles per square centimetre of skin. When a person reaches puberty, vellus hair-bearing parts of their body frequently start to sprout darker, thicker body hair.

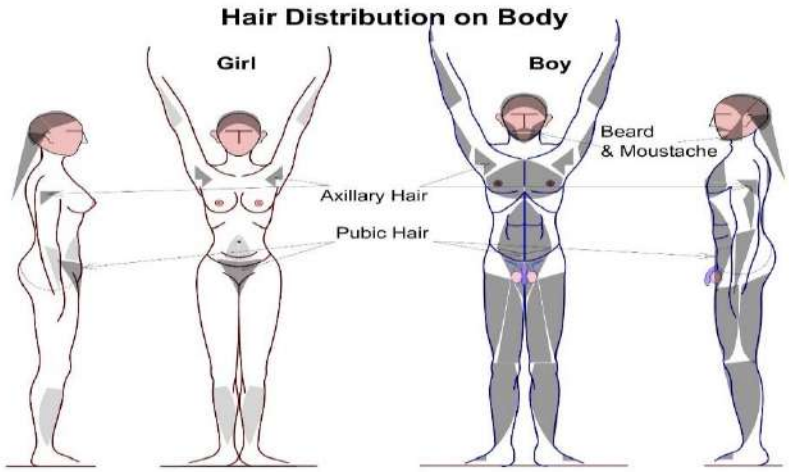


Figure3: Hair Distribution on Body [13].

Leg, arm, chest, and back hair all start out as vellus hair, just like most of the hair on the human body. The hair in these areas starts to get thicker and darker as people get older. This development takes place during or after puberty.

Excess body hair:

A. Chest and Abdomen hair:

Both sexes have vellus hair that grows in all phases of development on their chests and abdomens. Men develop a growing amount of terminal hair over their chest and abdomen as adolescence comes to a conclusion and into maturity.[10]. Both boys and girls have extremely fine vellus hair covering their abdomens before to puberty. The skin of the abdomen starts to generate coarser,

longer, more pigmented hair (terminal hair) during and after puberty in response to increased levels of androgens, primarily dihydrotestosterone.[11].

B. Arms hair:

The forearm's wrist end has the most terminal arm hair, which also extends over the hand. Teenage guys frequently experience terminal hair growth that is significantly more intense than that of girls, especially if they have dark hair. Women often shave their arms, while this practice is less popular than shaving their legs in some countries. Boys get terminal hair development on their arms during the final stages of puberty, which is a secondary sexual feature.

C. Pubic hair:

The collection of coarse hair known as pubic hair is located in the pubic region. It frequently spreads to the thighs and abdomen as well. According to zoologist Desmond Morris, pubic hair serves as a scent trap, refuting notions that it evolved to advertise sexual maturity or protect the skin from chafing during copulation. The pituitary gland releases gonadotropin hormones at this time, which cause the generation of testosterone in the testicles and ovaries and encourage the growth of pubic hair.

D. Axillary hair:

The type of hair seen in the underarm area is known as underarm hair, also known as axillary hair or armpit hair. Similar to the majority of other body hair, this hair typically begins to emerge throughout puberty and is fully grown by the end of adolescence [10]. The favourable olfactory reaction in mammals and the subsequent stimulation of sex drive brought on by pheromone production provide helpful hints as to the function and significance of axillary hair in humans. [12].

E. Facial hair:

Most facial hair develops on or near the face. Males and females both develop facial hair. Non-vellus facial hair will start to appear around puberty, just like pubic hair does. Young men's moustaches typically start to develop around puberty, while some guys may not develop one at all until their late teens. Many women frequently grow a few facial hairs on the upper lip, down the sides of the face, or under or around the chin.

Human hair growth:

Variable parts of the body have variable levels of sensitivity when it comes to androgens, mainly testosterone and its derivatives, particularly dihydrotestosterone. Individual levels of androgen and the sensitivity of the hair follicle to androgen, as well as other traits like hair colour, type of hair, and hair retention, are all influenced by genetic factors. Pubic hair is the first to appear because of the area's unique sensitivity to androgen, and the order in which terminal hair appears indicates the degree of androgen sensitivity. In both sexes, the development of pubic hair is typically regarded as a sign that puberty has begun. The quantity and location of androgenic hair fluctuate by sex, with males often having more terminal hair in more regions [10].

Day to Day life impact:

The medical term "hirsutism," which refers to "excess" body hair in the "male" distribution, is exclusive to women. Despite raising significant gender concerns and being linked to social and psychological problems like anxiety, social avoidance, and confusion over gender identity, there hasn't been much systematic research on the subject. [14].

Hirsutism can run in families. It may also be caused by:

- Polycystic ovarian syndrome. This is the most typical reason why women get hirsutism.
- Problems with the thyroid, adrenal, or pituitary glands
- Extreme insulin resistance
- Hormone changes brought on by menopause
- Using corticosteroids or anabolic steroids
- Utilizing medication to address endometriosis
- A few additional medications

Symptoms of hirsutism:

Each person may experience symptoms slightly differently. These consist of thicker or darker hairs growing on body parts like:

- Upper lip
- Chin
- Jawline
- Chest
- Back
- Buttocks

Hair removal:

For aesthetic reasons, people may want to have hair removed from different areas of their bodies. Body hair can be removed in a variety of methods. At-home techniques include epilation, shaving, and the use of hair removal products. The hair covers practically the whole human body. An infant may be covered in lanugo hair, which is fine, non-pigmented hair, during the first few weeks of life. Under the arms, in the pelvic region, and on the face, terminal hair takes the place of vellus hair throughout puberty. Terminal hair can also be seen on the toes or around the nipples [14]. Within the cosmetic and personal care market, hair removal is becoming a more significant area.[15].

Methods for removing Hair:

There are many different hair removal methods and products on the market today. Temporary techniques can result in hairless skin for 1-3 days or up to 3 weeks, depending on the procedure used and the physiological parameters of the individual. Techniques that involve the use of cosmetic goods are indicated and shaded. The temporary hair removal procedures known as epilation and depilation are two different kinds [16].

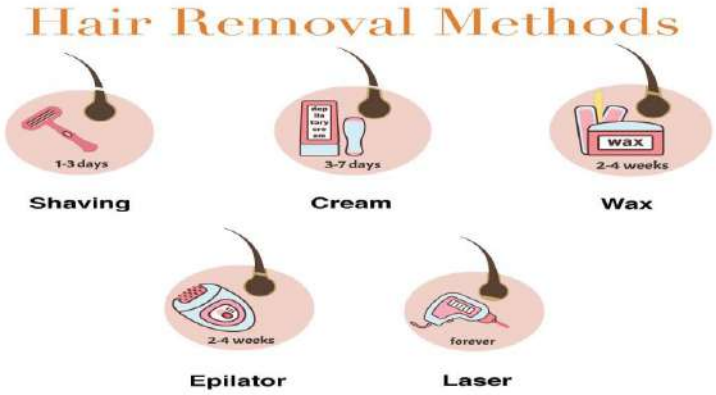


Figure 4: hair removal methods [20].

1. Depilatory techniques:

Merely a portion of the hair shaft that extends beyond the skin's surface is eliminated by depilatory methods and products. In the event that there is no skin injury, these procedures usually cause little pain. Shaving, trimming, utilizing abrasives, applying chemical depilatories, and bleaching are examples of depilatory methods.[16].

Shaving:

Shaving is a common and affordable method for removing hair from the female underarms and legs and for removing facial hair in men. There are two ways to shave:

a. Wet with an electric razor
b. Dry with a safety razor.

Shaving (wet or dry) is a temporary hair removal technique that requires constant care because it does not stop the anagen phase. Although shaving is cheap and convenient, it can lead to skin abrasions, and pseudo folliculitis. It is rare for women to remove facial hair because shaving does not alter the thickness or growth rate of hair and

leaves a blunt point that seems thicker than uncut hair [17].

Figure 5: Shaving Method [20].

2. Epilatory techniques:

With its root in the dermis, the entire hair shaft is removed using epilation procedures and materials. Since the hair shaft takes longer to fully renew than it does to regrowth from under the skin, as in the case of shaving, these treatments are more effective and last longer. Using epilators, tweezing, waxing, sugaring, threading, and taking medicine are some epilation techniques [16].

- **Plucking:**

Using tweezers to pluck hairs in small regions is a temporary solution that works best for eliminating terminal hairs rather than vellus hairs, which tend to break close to the skin's surface. Plucking is easy, cheap, leaves the skin relatively unharmed, and allows for a longer period of time for the skin to recover (2 to 12 weeks). Nevertheless, plucking can be a laborious procedure, making it unsuitable for application across larger regions, and it does not change the rate at which hair grows unless the hairs are in the anagen phase.[17].

Figure 6: Plucking Method [22].

- **Threading:**

To pull and trap hairs, threading is the process of applying a twisted cotton thread loop, held in place by teeth and the fingers, to the skin. Men use threading to get rid of hair on their cheeks, ears, and foreheads, while women use it to get rid of facial hair. Known as fatlah in Egypt, threading is a temporary hair removal method that has been used extensively throughout the Middle East and has acquired appeal in Western cultures for its accuracy in eyebrow shape.[17].

Figure 7: Threading Method [23].

- **Waxing:**

Popular for short-term hair removal, waxing leaves skin hair-free for two to six weeks, depending on the body part and rate of hair development in the individual. For larger regions, waxing is a popular technique. Beeswax and rosin combined with chemicals, preservatives, essential oils, and other ingredients make up wax. In beauty salons, hot wax is preferred over cold wax because the heat dilates the follicular opening, making hair removal easier. Over time, follicular damage from frequent waxing might decrease hair regrowth.[17].

Figure 8: Waxing Method [24].

- **Sugaring:**

Sugaring is an old hair removal method from the Middle East and Egypt that involves applying a paste made of sugar, lemon juice, and water to the skin in the direction that hair grows, then using a towel to remove the paste in the opposite way. In addition, sugaring is less likely to cause skin trauma, redness, or scarring than heated waxing or shaving because it uses natural substances and is safe, affordable, moisturizing, and painless [17].

Figure 9: Sugaring Method [25].

- **Lasers:**

For some people, laser hair removal is permanent. It is based on selective photo thermolysis, which produces thermal injury without causing skin damage by emitting light with a particular wavelength (nm), pulse length, and fluence. Melanin in the hair shaft and bulb absorbs light directly, or it can be absorbed by the follicle with the application of an external chromophore topically.[17].

Figure 10: Laser Method

- **Cream:**

Depilatories, another name for chemical hair removal solutions, are cosmetic preparations that are used to eliminate hair from the skin. They function by dissolving sulfur bonds in the keratin of the hair that are vulnerable to potent alkaline and deoxidation chemicals. Strong alkalis, like sodium hydroxide, are employed to achieve a high concentration of hydroxide ions for maintaining thioglycolic acid as an active dianion in the product.[27]. Because thioglycolate is the primary ingredient in hair removal creams, they have been investigated as potential penetration enhancers for trans epidermal medication delivery.[28].

Figure 11: cream

Depilatory lotions are treatments that remove hair. Thioglycolic acid is a major component in hair removal cream. Using depilatory creams, the keratin structure is disrupted, resulting in the removal of hair. These days, they are created with premium formulas that include calming and nourishing ingredients like cocoa butter, aloe vera, and vitamin E. [29]. Thioglycolic acid and thiolactic acid salts are frequently used as active agents. [30].

The main chemical reaction effected by the thioglycolate is:

2HSCH2CO2H(thioglycolicacid)+ R-S-S-R(cystine)→ HO2CCH2-S-S-CH2CO2H (dithiodiglycolic acid) + 2 RSH (cysteine)

After depilation, the skin is carefully rinsed with water and treated with a variety of conditioners to bring its ph back to normal. [31]. In polycystic ovarian syndrome, chemical depilatories are recommended for the treatment of hirsutism.[32]. According to Jewish tradition, King Solomon found a chemical depilatory that was created by

combining lime, water, and orpiment (arsenic trisulfide).[33].

Ideal characteristics of hair removal cream:

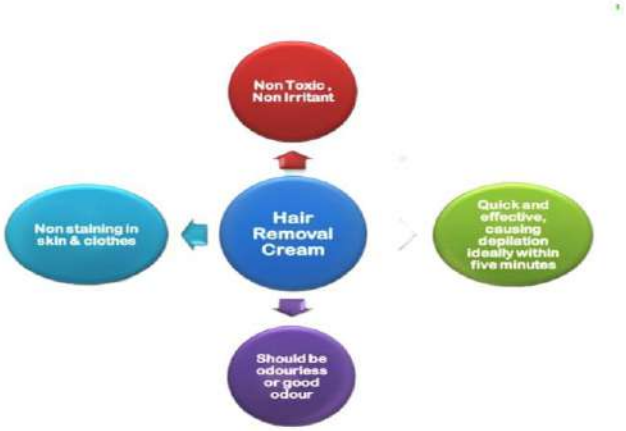


Figure12: Idal characteristics of hair removal cream.

Advantages:

1. The greatest thing about depilatory creams is that, in contrast to shaving, threading, plucking, or waxing, they provide painless hair removal.
2. The hair dissolves and is removed with the cream, leaving no trace behind and emptying the drain.
3. Depilatory creams are an inexpensive and painless method of hair removal that can be found in any cosmetic stores.

Disadvantages:

1. The lotions chemicals have the potential to irritate and pain users.
2. Due to the chemicals utilized, depilatories are known to have unpleasant scents.
3. Potential for ingrown hairs.

Chemicals use in hair removal cream:

- Thioglycolic acid
- Calcium hydroxide
- Sodium lauryl sulfate
- Sodium silicate
- Cetearly alcohol
- Sodium gluconate
- Potassium thioglycolate
- Vitamin E
- Cetyl alcohol
- Calcium carbonate
- Liquid paraffin
- Paraffinum liquidum

Herbal ingredients use in hair removal cream:

- Prosopis cineraria
- Allium sativum
- Cyperus rotundus
- Aleo vera
- sunflower
- Neem
- Tulsi
- Ginger
- Lemon
- Honey
- Banana
- Turmeric

Typical brands are:

- Veet hair removal cream
- Natures Essence Soft Touch Gold Hair Removal Cream
- Oxy Herbal Hair Removal Cream
- Olivia Hair Removing Cream

Side effects of chemical hair removal cream:

Nowadays, a lot of people utilize depilatory or hair removal treatments to get smooth, hair-free skin without experiencing any pain or discomfort. Permanent hair removal creams are special because they are simple to apply and quite successful, in contrast to other hair removal techniques that frequently include instruments and hurt.[34].

1. Darkness and Irritation:

The majority of hair removal creams contain thioglycolic acid salts and compounds like potassium and calcium hydroxide, which can irritate delicate skin types and result in black spots. Before using hair removal lotion to your entire body, think about conducting a patch test because these are equally important adverse effects.

2. Skin Damage and Allergic Reactions:

These lotions include acidic ingredients that can react with your skin to change its pH, resulting in allergic responses and skin damage. For this reason, it's critical to understand before using hair removal cream the potential negative effects on the face and private areas of the body

3. Chemical Burns:

These hair removal creams might even cause varying degrees of chemical burns if you use them on extremely sensitive skin or if you don't use them for the whole recommended duration! Therefore, be sure to follow the directions on the depilatory cream package precisely, and before you start, do a patch test.[34].

Cyperus rotundus:

Cyperus rotundus tubers are among the first known medicinal herbs, and people have been using them to treat a variety of illnesses since ancient times. [18]. Nutgrass, or Cyperus rotundus Linn, is a member of the Cyperaceae family. It is frequently referred to as Nagarmotha. It is an invasive perennial that emerges from subterranean tubers and has dark green, glabrous culms.[19] Cyperus rotundus (Cyperaceae) is a common invasive weed found in upland and paddy fields of tropical climates worldwide. Known as "the world's worst weed," its extract can be found in both industrialized and developing nations as over the counter medications (found in health food stores), home medicines, and raw materials for the pharmaceutical industry. One of the first recognized medicinal herbs for treating dysmenorrhea and irregular menstruation is Cyperus rotundus, namely its tuber section. Furthermore, applying Cyperus rotundus essential oil topically works well to slow down the growth of hair.[18].

Figure 13: Cyperus rotundus

Secondary metabolites of different plant sections are called essential oils. Plant essential oils offer special medicinal advantages. They are used in many different products, including lubricants, lotions, ointments, massage oils, and incense.[17] Applying Cyperus rotundus oil topically is a secure and efficient way to slow down hair growth. On androgenic hair, the flavonoids in the oil exhibit antiandrogenic effect. Androgen must always be present for sexual hair, or androgenic hair, to grow. For many women, this type of hair is unattractive and irritating, and it can cause serious psychological discomfort. Due to these worries, a multibillion-dollar endeavour has been launched to stop the growth of androgenic hair. For this, a variety of allopathic techniques have been used, including electro epilation, laser therapy, intense pulsed light (IPL) therapy, eflornithine cream, and oral antiandrogen drugs.[18]. One of the first known medicinal herbs used to treat dysmenorrhea and irregular menstruation is Cyperus rotundus, namely its tuber section. This herb's infusion has been used as an emmenagogue and for pain, fever, diarrhoea, dysentery, and other digestive issues. This adaptable plant is used extensively in traditional medicine worldwide to heal wounds, blisters, boils, and stomach problems.

Medicinal uses of Cyperus rotundus:

According to the Ayurveda, Cyperus rotundus rhizomes are considered:

- Astringent
- Diaphoretic
- Diuretic
- Analgesic
- Antispasmodic
- Aromatic
- Carminative
- Antitussive
- Emmenagogue
- Litholytic
- Stomachic
- Vermifuge
- Antibacterial

They are used in treatment of nausea and vomiting, dyspepsia, colic, flatulence, diarrhoea, dysentery, intestinal parasites, fever, malaria, cough, bronchitis, renal and vesical calculi, urinary tenesmus, skin diseases, wounds, amenorrhoea, bronchitis, infertility, cervical cancer and menstrual disorders, and the aromatic oils are made of perfumes and splash.

Pharmacological Activities of Cyperus rotundus:

- Anti-androgenic
- Anti-inflammatory
- Anti-diabetic
- Anti-diarrhoeal,
- Cytoprotective
- Anti-mutagenic
- Anti-microbial
- Anti-bacterial
- Anti-oxidant
- Cytotoxic
- Apoptotic
- Anti-pyretic
- Anti-Candida

Cyperus rotundus contains an essential oil that provides for the characteristic odour and taste of the herb, comprised mostly sesquiterpene hydrocarbons, epoxides, ketones, monoterpenes and aliphatic alcohols. Cyperus rotundus phytochemical composition showed the presence of glycerol, linolenic, myristic, stearic, alkaloids, flavonoids, tannins, starch, glycosides, fur chromones, monoterpenes, sesquiterpenes, sitosterol, and fatty oils including a neutral waxy component. The primary chemicals identified from the essential oil and rhizome extracts of Cyperus rotundus are: beta-pinene, beta-rotunol, beta-cyperone, beta-selinene, and beta-pinene. Camphene, Cyperene, Cyperenone, Cyperol, Cyperolone, Copaene, and Calcium Cyperotundone D-fructose, D-glucose, D-copadiene, D-epoxyguaiene, Flavones, Omega-cymene, and the names Rotundene, Rotundenol, and Rotundone Selinatrine, Sugeonol, Sugetriol, Stearic Acid, and Sitosterol.[35].

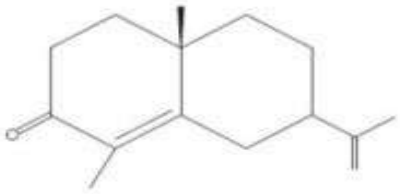
MATERIAL AND METHODOLOGY:

Materials:

1. Cyperus rotundus oil
2. Thioglycolic acid
3. Acetyl alcohol
4. Calcium hydroxide
5. Vitamin E
6. Calcium carbonate
7. Orange oil
8. Liquid paraffin
9. Water

I. Cyperus rotundus:

Kingdom: plantae
Subkingdom: Tracheobionta
Division: Magnoliophyta
Class: Liliopsida
Order: Cyperales
Family: Cyperaceae
Structure:



α-Cyperone

Synonyms:

- Ayurvedic: Musta, Mustaa, Mustaka, Abda, Ambuda, Ambhoda, Ambo Dhara, Bhadra, Bhadra, Bhadra Musta, Bhadra Musta, Bhadramustaka, Ganda-Durva.
- Siddha: Koraikkizhangu
- Hindi: Motha, Nagarmotha
- Assamese: Mutha, Somad Koophee
- Bengali: Mutha, Musta
- Marathi: Moth, Nagarmoth, Motha, Bimbal
- English: Coco-Grass, Java Grass, Nut Grass, Purple Nut Sedge, Purple Nutsedge.

Medicinal properties of Cyperus rotundus:

The rhizomes of Cyperus rotundus contain a number of active chemical components. The roots have the following therapeutic qualities as a result of these components.

- Antiandrogenic: Decrease hair growth.
- Antioxidant: Strong radical scavenging action; Prevents free radical damage of cells.
- Anthelmintic: Destroy parasitic worms.
- Antifungal: Effective against fungus.
- Antispasmodic: prevents or relieves spasms/cramps.
- Anti-hyperglycaemic: lowers the blood glucose levels.
- Hepatoprotective: Protects the liver and improves the liver functions.
- Hypotensive: lowers blood pressure.[37].

II. Thioglycolic acid:

IUPAC Name: Sulfanylacetic acid

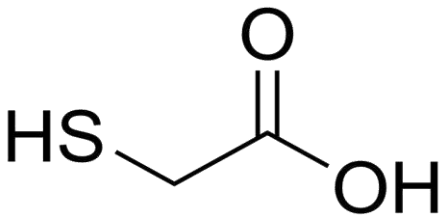
Other names:

2-Sulfanylaceti acid
2-Mercaptoacetic acid
Mercaptoacetate
Mercaptoacetic acid
Thioglycolic acid
Thiovanic acid

Taxonomical properties:

Chemical Formula -$C_2H_4O_2$
Molar Mass -92.11 G. Mol $^{-1}$
Appearance -Colourless, Clear Liquid
Odor -Strong, Disagreeable
Melting Point - -16°C (3 °F; 257 K)

Structure:



Uses:

1. TGA was first and is still used as a chemical depilatory, particularly in salt versions as sodium and calcium thioglycolate. Ammonium thioglycolate, which is utilized in permanents, is derived from TGA. Giving hair a "perm" is one way to mend these damaged links. In addition, it is employed in the production of thioglycolates, as an indicator of acidity.
2. Additionally, TGA has been used to soften nails in order to let topical antifungals penetrate the nail or to reposition pincer nails into the proper position.
3. PVC stabilizers that are organotin derivatives of is octyl esters of thioglycolic acid are commonly employed. [39].Because of its reducing properties, thioglycolic acid (TGA), thioglycolates, and thiol esters are widely used in cosmetics, particularly in hair treatment products and depilatory lotions.[38].

III. Acetyl alcohol:

IUPAC Name: Hexadecan-1-ol

Other names:

Cetanol

Cetyl alcohol
Hexadecyl alcohol
Palmityl alcohol

Taxonomical properties:

Chemical formula: C 16 H34 O
Molar mass: 242.447 g.mol -1
Appearance: white crystals or Flakes
Odor: very faint, waxy
Melting point: 49.3 °C (120.7 °F; 322.4 K)

Structure:

Uses:

- In the cosmetics sector, acetyl alcohol is used as an opacifier in shampoos and as an emollient, thickening agent, or emulsifier in the formulation of skin creams and lotions. [41].
- It is the active component of certain "liquid pool covers" and is also used as a lubricant for nuts and bolts.[40].
- Utilized in the manufacturing of face creams, lotions, lipsticks, toilet preparation products, antiperspirant sticks, and cosmetics, medications, fragrances, and shampoos Moreover, it is employed as a monomer lubricant in suspension polymerization, a base for the synthesis of sulfonated fatty acids, a coupling agent, a foam stabilizer in detergents, and a way to delay the evaporation of water when sprayed on developing plants or applied as a film over reservoirs.[44].

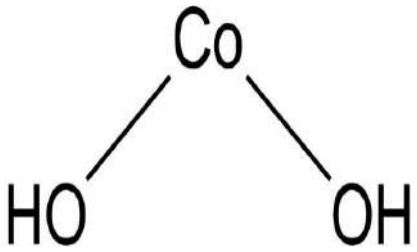
Role of acetyl alcohol in cosmetic products:

Because of its amazing qualities, acetyl alcohol is efficiently employed in a wide range of skincare and hair care products. By acting as an emulsifying agent and keeping the water and oil in the mixture together, acetyl alcohol gives your cosmetic product stability. It improves the product's texture and gives your beloved makeup a slip so that it slides over your skin and hair with ease and aids in applying makeup evenly.[43].

IV. Calcium hydroxide:

IUPAC Name: Calcium hydroxide
Other names:
Slaked lime
Hydrated lime
Portlandite
Calcium hydrate
Calcium Di hydroxide
Taxonomical properties:
Chemical formula: Ca (OH)2
Molar mass:74.093 g/mol
Appearance: white powder
Odor: odorless
Melting point: 580 °C (1,076 °F; 853 K)

Structure:[45]



uses:

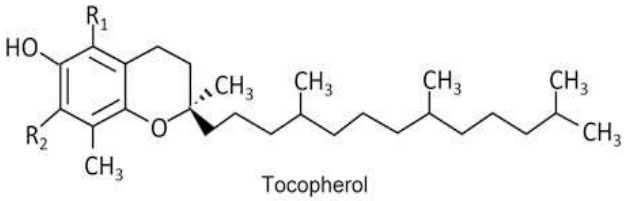
1. Lime mortar is frequently made with calcium hydroxide.
2. Using calcium hydroxide as a flocculant in the treatment of sewage and water is one such application.
3. It is also employed in the following reaction to produce ammonia gas (NH3):
   2 NH3 + CaCl2 + 2 H2O → Ca (OH)2 + 2 NH4Cl
4. Calcium hydroxide finds application in hair care products, insecticides, and ebonite production.
5. Calcium hydroxide is used to fill cavities in human teeth during root canal treatments. [46].

V. Vitamin E:

Taxonomical properties:

- Colour: pale yellow oil
- Taste: no taste
- Odor: no odor
- Boiling point: 210 °C
- Melting point: 3°C

Structure:[47]



Source of vitamin E:

A wide range of foods contain vitamin E. The finest sources of alpha-tocopherol are nuts, seeds, and vegetable oils.[49]. As a vitamin, vitamin E may have a number of purposes. Numerous biological roles have been proposed, one of which is that of a fat-soluble antioxidant [48]. Vitamin E is a micronutrient that is physiologically necessary and has applications in medicine, pharmaceutics, cosmetics, and food. [47].

Uses:

- Vitamin E is probably useful in complementary and alternative medicine for treating and preventing vitamin E deficiency as well as for ataxia with vitamin E deficiency, a disorder characterized by extremely low blood levels of the vitamin that impairs movement and motor coordination.
- Atopic dermatitis, cataracts, high blood pressure, liver disease, Parkinson's disease, pre-eclampsia, scarring from surgery, pain or stiffness from osteoarthritis, andmacular degeneration age-related vision loss has all been treated or prevented with vitamin E. [50].

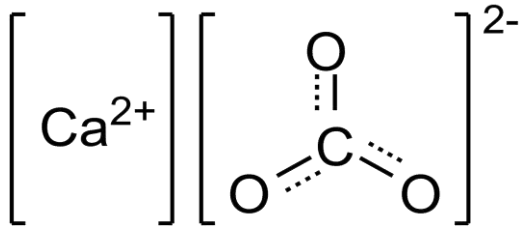
VI. Calcium carbonate:

Other names:
Aragonite
Calcite
Limestone
Marble
Oyster shell

Taxonomical properties:

Chemical formula: CaCO3
Molar mass: 100.0869 g/mol
Appearance: Fine White Powder, Chalky Taste
Odor: Odorless
Melting Point: 1,339 °C

structure:



Uses:

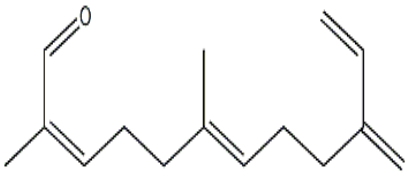
- Calcium carbonate is mostly used in the construction sector, either as a building material, as limestone aggregate for constructing roads, as a component of cement, or as a raw material that is burned in a kiln to create builders' lime.
- Iron from iron ore is additionally purified in a blast furnace using calcium carbonate. After the carbonate is calcined in place, calcium oxide is produced.
- Additionally, it is a raw ingredient used in the sugar beet refining process.[51].

VII. Orange oil:

Taxonomical properties:

Molecular Formula: C15H22O
Molecular Weight: 218.33458
Boiling point: 176 °C(lit.)
Odor: at 100.00 %. sweet orange citrus aldehydic terpenic tangerine pulpy [53].

Structure:



Orange oil is an essential oil that is produced by the orange fruit's (Citrus sinensis fruit) rind cells. Unlike other essential oils, this one is derived as a by-product of centrifuging orange juice, yielding a cold-pressed oil.[52].

Uses:

- Helps to reduce acne: Orange essential oil's antibacterial properties can aid in reducing the microorganisms that cause acne. It may also aid in lowering acne-related inflammation.
- Prevents damage: The high concentration of limonene helps shield your skin from the damaging effects of smoke, pollution, and sunlight.
- Enhances the look of pores: The oil's astringent properties aid to tighten pores and control sebum production.[54].

VIII. Liquid paraffin:

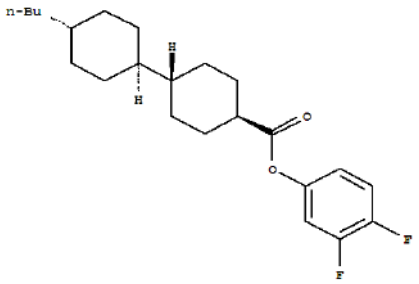
Other names:

paraffinum liquidum
paraffin oil
liquid paraffin oil

Taxonomical properties:

Formula: C 20 H 42
Appearance: colourless
Boiling point: >300°C
melting point: -10°C

structure:[56].



It is a very refined mineral oil that is utilized in both medicine and cosmetics. Liquid paraffin used for cosmetics or medication purposes should not be mistaken with fuel-grade paraffin, or kerosene. There are geographical variations in the definitions of paraffin and paraffin oil due to the general understanding of paraffin being an alkane.

Uses:

- Liquid paraffin is a cleaning and moisturizing substance. As a result, it is a common ingredient in skin and hair care products.
- It's also one of the components used in after-wax wipes.
- In medicine, liquid paraffin is commonly used as a pediatric laxative to relieve constipation and encopresis.
- It can be applied to tablets and capsules as a lubricant, binder, or releasing agent.[55].

IX. Water:

IUPAC name: Oxidane

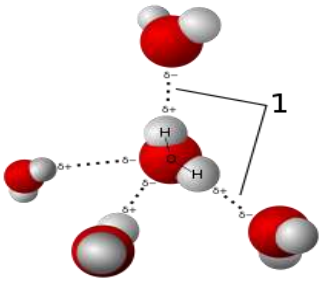
Other names:

Hydrogen oxide
Hydrogen hydroxide
Hydric acid
Hydrohydroxic acid

taxonomical properties:

Formula: H2O
Appearance: Almost colorless
Odor: odorless
Melting point: 0.00 °C
Boiling point: 99.98 °C

structure:



Except for a natural tinge of blue, water (H2O), a polar inorganic molecule, is essentially colourless and tastes and smells tasteless at room temperature. The chemical molecule in question is widely researched and is referred to as the "universal solvent" or the "solvent of life". [57].

Uses:

- In the context of cosmetics, water has been called "the universal solvent." Water can be combined with "thicker" components,

including butters and oils, together with emulsifiers to help create emulsions that can be used to make creams and lotions.

- Water is necessary for the extraction and production of many natural raw materials; occasionally, it is combined with other solvents like glycerine or ethanol for this purpose.
- Water is mostly utilized as a solvent in cosmetics and other personal care products, dissolving many of the components, like conditioning and cleansing agents, that provide benefits to the skin.[58]

Methodology:

Extraction method of Cyperus Rotundus:

1. The Cyperus rotundus tuber pieces were crushed to a coarse powder and dried at room temperature.
2. The powder was extracted with boiling water for 15-20 minutes.
3. Then filtered it.
4. After that the extracts were lyophilized (aqueous extract).
5. Water was used to dissolve the residue.
6. The powder was macerated for 24 hours with constant stirring in a water/acetone mixture (1:2 v/v) to produce an extract enhanced with total oligomers flavonoids (TOF).
7. To obtain an aqueous phase, the extract was filtered and the acetone was evaporated under low pressure.
8. Tannins were eliminated by precipitation for 24 hours at 5 °C using an excess of NaCl.
9. The tubers of Cyperus rotundus were Soxhlet extraction for 6 hours to extract the essential oil.
10. Essential oil was obtained.

Preparations of hair removal cream:

1. Heat liquid paraffin, beeswax and cetyl alcohol in a borosilicate glass beaker at 75° c.
2. Maintain that heating temperature (oil phase).
3. Take mortal pestle and mix well calcium hydroxide, vitamin E.
4. After that add mixture slowly in the oil phase and stir continuously.
5. Then add measured amount Cyperus rotundus extract
6. Stir vigorously until it forms a smooth cream.
7. Then add an active ingredient thioglycolic acid in cream and stir continuously up to it mix well in cream.
8. Then add some orange oil as a fragrance.
9. Stir it properly until proper cream was formed.

FORMULATION TABLE:

Ingredients	F1	F2	F3
Cyperus rotundus essential oil	10.5ml	9ml	10ml
Thioglycolic acid	2ml	3.5ml	1.5ml
Cetyl alcohol	2gm	3gm	1.5gm
Calcium hydroxide	2.5gm	3gm	2 gm
Vitamin E	2.5gm	3gm	2 gm
Bees wax	2.5gm	3gm	2gm
Orange oil	1.5ml	3ml	2 ml
Liquid paraffin	1.5ml	2.5ml	1ml
Water	q.s. to 30 gm	q.s. to 30 gm	q.s. to 30gm

Evaluation Parameter:

1. Cream Organoleptic:

The evaluation's focus was on the cream's color, texture, and overall odour.

a. Colour

The color of the formulation was analysed against a white background.

b. odour

I sniffed the cream to confirm its odour.

c. Texture

The texture was assisted by application on skin.

1. Determination of pH:

pH paper was used to measure the pH.

2. Determination of homogeneity:

Once the gel-like materials have solidified in the container, each produced cream is examined visually to assess its uniformity.

3. Determination of viscosity:

Using Brookfield Viscometer Spindle No. 5 and spindle speed of 10 rpm at 25°C, the viscosity of the formulated cream was measured. The corresponding dial reading on the viscometer was recorded.

4. Determination of washability:

The strength and simplicity of water washing were measured by hand after the skin had been treated with the formulation.

5. Determination of pharmacological activity:

F1-There are no adverse effects, irritations, reported with the F1 depilatory cream. Because of its ph of 10.8 this batch's hair removal action is slow.

F2-The ph 13.75 of the F2 depilatory cream causes adverse effects such redness, itching, and inflammation. Additionally, this batch's hair removal process is quick.

F3-This batch's normal pH of 12.3 makes hair removal very easy and smoothly. It has no adverse effects on the hands.

RESULT AND DISCUSSION:

Parameter	F1	F2	F3
Color	Light yellow	yellow	Light yellow
Odor	Pleasant	Pleasant	Pleasant
Texture	smooth	smooth	smooth
Ph	10.8	13.75	12.3
Homogeneity	Smooth and glossy	Smooth and glossy	Smooth and glossy
Viscosity	21020 rpm	11810 rpm	18400 rpm
Washability	Good	Good	Good
Side effects	No side effect	Itching, redness	No side effect
Time taken	15-20 min	3-6 min	5-8 min
Hair removal Process	Slow	Fast	Fast

Physical characteristics like color, texture, and odor were examined. Ph paper was used to measure the ph. Products with a ph of 13 will often irritate skin when applied, whereas those with a ph of 10.5 will typically act slowly. The homogeneity of the formulation was assessed by touch and visual inspection. Using spindle number 63 at 2.5 RPM at a temperature of 25 degrees Celsius, the viscosity of the prepared cream was measured using a Brookfield viscometer. Skin application of the formulation and water wash were manually inspected. On the hand, every cream formulation was examined. On the right hand, mark the region (3-3cm). After applying the cream to that location, the time was recorded

CONCLUSION

The physiochemical properties and pharmacological activity of each formulation were assessed. Based on the a for mentioned findings, it can be inferred that the hair removal cream made with an herbal base is made by combining chemical and herbal substances, such as thioglycolic acid and Cyperus rotundus essential oil, and it has appropriate color, ph, and spread ability testing. Out of all the formulations, F3 offers the best attributes. This cream is effective for hair removing.

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