POLY HERBAL SKIN CLARIFYING AND UV PROTECTION CREAM

Zeel Shah1, Shweta Prasad2, Aarti Soni3, Shailaja Shah4, Mantasha Shaikh5, Dr. Riddhi Trivedi6
[1,2,3,4,5]*BPharm Student at SAL Institute of Pharmacy*
[6]*Professor at BPharm, SAL Institute of Pharmacy*

Abstract- **Poly herbal skin clarifying and UV protection cream is a herbal cream which was formulated for the purpose of moisturizing, hydrating, making skin supple, anti aging, anti wrinkle, depigmentation, anti oxidant, maintaining skin Ph, nourishing, UV protection and treatment of various skin diseases like hyperpigmentation, wrinkles, acne, skin aging, photoaging, tanning. Herbal cream was formulated by using crude drugs like Aloe barbadensis (Aloe vera), Azadirachta indica(Neem), Daucus carota(Carrot seed), Citrus limon(Lemon peel), Chrysopogon zizanioides(Vetiver root), Panax ginseng(Ginseng), Ginkgo biloba, Cucumis sativa(Cucumber seed) respectively. We have developed 9 batches of our herbal cream namely F1, F2, F3, F4, F5, F6, F7, F8, F9. The prepared cream was evaluated for various parameters like Appearance, Thermal stability, Patch test, Spreadability test, Microbial growth, Irritancy, Viscosity. The formulation F1 showed good appearance, adequate viscosity, no phase separation. Also showed no redness, irritation during irritancy study, was easily spreadable and was stable at room temperature. Thus the cream proved to be safely used on skin which provides a protection from UV rays.**

I. INTRODUCTION

- **Cosmetic[1]:**

Cosmetic is defined under section 3(aaa) of the Drugs and Cosmetics Act, 1940 as, any article intended to be rubbed, poured, sprinkled or sprayed on, or introduced into, or otherwise applied to, the human body or any part thereof for cleansing, beautifying, promoting attractiveness or altering the appearance, and includes any article intended for use as a component of cosmetic.

- **Cosmoceutical:**

Cosmoceuticals are cosmetic products with bioactive ingredients purported to have medical benefits. There are no legal requirements to prove that these products live up to their claims. Cosmeceuticals are products that have both cosmetic and therapeutic (medical or drug-like) effects, and are intended to have a beneficial effect on skin health and beauty. Like cosmetics, they are applied topically as creams or lotions but contain active ingredients that have an effect on skin cell function.

- **Herbal cosmetics[2]:**

The herbal cosmetics are the preparations containing phytochemical from a variety of botanical sources, which influences the functions of skin and provide nutrients necessary for the healthy skin or hair. Herbal cosmetics also known as “natural cosmetics”. At the time, there were no fancy fairness creams or any cosmetic surgeries. The only thing they had was the knowledge of nature, compiled in the ayurveda.

- **Cream:**

Cream is defined as semisolid emulsions which are oil in water (o/w) or water in oil (w/o) type and these semisolid emulsions are intended for external application.

- **Herbal Cream:**

Herbal Cosmetics are the cosmetics which are prepared using plant products having cosmetic actions. In cosmetics, both natural and Phyto-ingredients are used. Natural products include oils, extracts, secretions etc. **Cream is defined as semisolid emulsions which are oil in water (o/w) or water in**

oil (w/o) type and these semisolid emulsions are intended for external application.

Cream is classified as oil in water and water in oil emulsion. It is applied on outer part or superficial part of the skin and its main ability is to remain for a longer period of time at the site of application. The function of a skin cream is to protect the skin against different environmental condition, weather and gives soothing effect to the skin. There are different types of creams like cleansing, cold, foundation, vanishing, night, massage, hand and body creams. The main aim of our work is to develop a herbal cream which can give multipurpose effect, like moisturizer, reduce acne and skin irritation, heal dry skin, wrinkles, rashes etc. and also adding glow to the face. The concept of beauty and cosmetics is as ancient as mankind and civilization. Indian herbs and its significance are popular worldwide. Herbal cosmetic have growing demand in the world market and is an invaluable gift of nature. Herbal formulations always have attracted considerable attention because of their good activity and comparatively lesser or nil side effects with synthetic drugs. Herbal cosmetics are defined as the beauty products which posses desirable physiological activity such as healing, smoothing appearance, enhancing and conditioning properties because of herbal ingredient. Now-a-days the usefulness of herbs in the cosmeceutical production has been extensively increased in personal care system and there is a great demand for the herbal cosmetics. Cosmetics are the substances intended to be applied to the human body for cleansing, beautifying, promoting attractiveness, and altering the appearance without affecting the body's structure or functions. But the usage of synthetic products becomes very harmful from long time for the youth as well as our environment. Various synthetic compounds, chemicals, dye and their derivative proved to cause various skin diseases having numerous side effects. Thus we are using herbal cosmetics as much as possible. The basic idea of skin care cosmetic lies deep in the Rigveda, Yajurveda, Ayurveda, Unani and Homeopathic system of medicine. These are the products in which herbs are used in crude or extract form. These herbs should have varieties of properties like antioxidant, anti-inflammatory, antiseptic, emollient, anti keratolytic activity and antibacterial etc. Cosmetics are developed to reduce wrinkles, fight acne and to control oil secretion. For various types of skin ailments formulations like skin protective, sunscreen, antiacne, antiwrinkle and antiaging are designed using varieties of materials, either natural or synthetic.

II. ABOUT DISEASES:

2.1 HYPERPIGMENTATION:

2.1.1 ETIOLOGY:

Hyperpigmentation can be caused by sun damage, inflammation, or other skin injuries, including those related to acne vulgaris. People with darker skin tones are more prone to hyperpigmentation, especially with excess sun exposure. Many forms of hyperpigmentation are caused by an excess production of melanin. Hyperpigmentation can be diffuse or focal, affecting such areas as the face and the back of the hands. Melanin is produced by melanocytes at the lower layer of the epidermis. Melanin is a class of pigment responsible for producing colour in the body in places such as the eyes, skin, and hair[3]. As the body ages, melanocyte distribution becomes less diffuse and its regulation less controlled by the body. UV light stimulates melanocyte activity, and where concentration of the cells is greater, hyperpigmentation occurs. Another form of hyperpigmentation is post inflammatory hyperpigmentation. These are dark and discoloured spots that appear on the skin following acne that has healed. Hyperpigmentation is associated with a number of diseases or conditions, including the following[4][5]:

- Addison's disease and other sources of adrenal insufficiency
- Cushing's disease or other excessive adrenocorticotropic hormone (ACTH) production
- Acanthosis nigricans—hyperpigmentation of intertriginous areas associated with insulin resistance.
- Melasma, also known as 'chloasma' or the “mask of pregnancy,” when it occurs in pregnant women.
- Post-Acne marks from post-inflammatory hyperpigmentation
- Linea nigra—a hyperpigmented line found on the abdomen during pregnancy.
- Peutz–Jeghers syndrome
- Exposure to certain chemicals such as salicylic acid, bleomycin, and cisplatin.

- Smoker's melanosis
- Coeliac disease
- Cronkhite–Canada syndrome
- Porphyria
- Tinea fungal infections such as ringworm
- Haemochromatosis
- Mercury poisoning—particularly cases of cutaneous exposure resulting from the topical application of mercurial ointments or skin-whitening creams.
- Aromatase deficiency
- Nelson's syndrome
- Graves' disease
- Schimke immunoosseous dysplasia (SOID)
- As a result of tinea cruris.
- Due to B12 deficiency[8]

Hyperpigmentation can sometimes be induced by dermatological laser procedures.

2.1.2 DIAGNOSIS:

- A physical examination including, Wood's lamp examination and a detailed history, usually sufficient for diagnosis.
- Skin examination.
- Viewing medical history.

2.1.3 TREATMENT:

There are a wide range of depigmenting treatments used for hyperpigmentation conditions, and responses to most are variable.

Most often treatment of hyperpigmentation caused by melanin overproduction (such as melasma, acne scarring, liver spots) includes the use of topical depigmenting agents, which vary in their efficacy and safety, as well as in prescription rules.

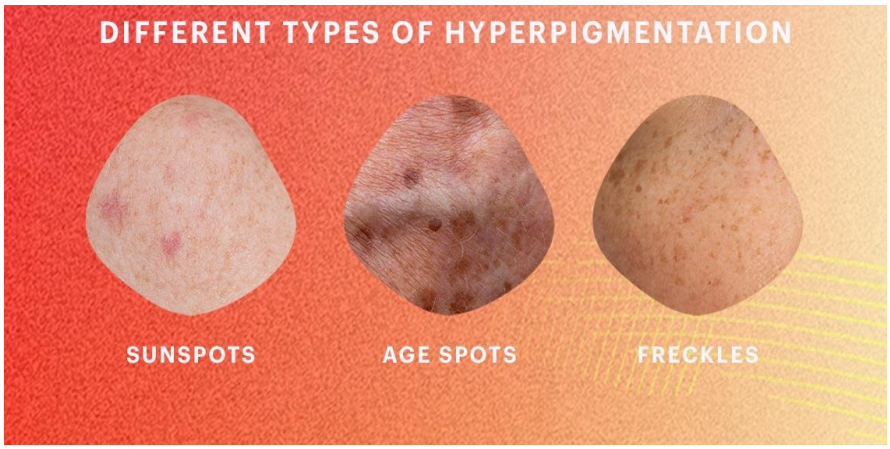


FIGURE I TYPES OF HYPERPIGMENTATION

2.2 ACNE[6]:

2.2.1 ETIOLOGY:

Acne is a common skin condition where the pores of your skin become blocked by hair, sebum (an oily substance), bacteria and dead skin cells. Those blockages produce blackheads, whiteheads, nodules and other types of pimples.If you have acne, know you're not alone. It's the most common skin condition that people experience. It's estimated that 80% of people ages 11 to 30 will have at least a mild form of acne, and most people are affected by it at some point in their lives. Though it mainly affects teenagers and young adults undergoing hormonal changes, many people continue struggling with acne into their 20s, 30s and beyond. Some even develop acne for the first time as adults. The most common spots where you might have acne are your face, forehead, chest, shoulders and upper back. Oil glands are all over your body, but those are the places where there are the most. The best way to treat acne depends on how severe it is. Acne can be mild (a few occasional pimples) moderate (inflammatory papules) or severe (nodules and cysts). Acne is largely a hormonal condition that's driven by androgen hormones, which typically become active

during the teenage and young adult years. Sensitivity to these hormones — combined with surface bacteria on the skin and fatty acids within oil glands — can result in acne.

Certain things can cause acne and/or make it worse:

- Fluctuating hormone levels around the time of a woman's period.
- Picking at acne sores.
- Clothing and headgear, like hats and sports helmets.
- Air pollution and certain weather conditions, especially high humidity.
- Using oily or greasy personal care products (like heavy lotions, creams or hair pomades and waxes) or working in an area where you routinely come in contact with grease (such as working at a restaurant where there are greasy food surfaces and frying oil).
- Stress, which increases the hormone cortisol, can also cause acne to flare.
- Some medications.
- Genetics.

2.2.2 TYPES OF ACNE[7]:

Acne can take several forms. They include:

- Blackheads: Open bumps on the skin that fill with excess oil and dead skin. They look as if dirt has deposited in the bump, but the dark spots are actually caused by an irregular light reflection off the clogged follicle.
- Whiteheads: Bumps that remain closed by oil and dead skin.
- Papules: Small red or pink bumps that become inflamed.
- Pustules: Pimples containing pus. They look like whiteheads surrounded by red rings. They can cause scarring if picked or scratched.
- Fungal acne (pityrosporum folliculitis): This type occurs when an excess of yeast develops in the hair follicles. They can become itchy and inflamed.
- Nodules: Solid pimples that are deep in your skin. They are large and painful.
- Cysts: Pus-filled pimples. These can cause scars.

All of these forms of acne can affect your self-esteem. It's best to seek help from your healthcare provider early so they can help determine the best treatment option(s) for you.

2.2.3 DIAGNOSIS: Your healthcare provider can diagnose acne during a skin exam. They may also ask if you're undergoing significant stress or if you have a family history of acne, all of which are risk factors. Teenage girls and women may also be asked about their menstrual cycles, as breakouts are sometimes related. Sudden, severe acne outbreaks in older people can sometimes signal another underlying disease that requires medical attention.

2.2.4 SEVERITY OF ACNE[6]:

Dermatologists rank acne by severity:

- Grade 1 (mild): mostly whiteheads and blackheads, with a few papules and pustules.
- Grade 2 (moderate, or pustular acne): multiple papules and pustules, mostly on your face.
- Grade 3 (moderately severe, or nodulocystic acne): numerous papules and pustules, along with occasionally inflamed nodules. Your back and chest may also be affected.
- Grade 4 (severe nodulocystic acne): numerous large, painful and inflamed pustules and nodules.

2.2.5 TREATMENT:

Your healthcare provider may suggest some non-prescription medications for your condition. Depending on the condition's severity, your age, the type of acne you have and how effective the over-the-counter remedies have been, you may need stronger prescription medications. The use of certain contraceptives can sometimes help a woman's acne go away. The Food and Drug Administration has approved three types of birth control pills for treating acne. All four contain a combination of estrogen (the primary female sex hormone) and progesterone (a natural form of steroid that helps regulate menstruation).Various medications and therapies have proven to be effective. They target the underlying factors that contribute to acne.

You might require at least one or multiple, depending on the severity of your condition.

2.2.6 PREVENTION:

Preventing acne is difficult if not impossible during normal hormonal changes. But some things can help:

- Wash your face daily with warm water and a mild facial cleanser.
- Routinely use moisturizer.
- You don't have to stop using makeup, but try to use "non-comedogenic" products and remove makeup at the end of each day.
- Keep your hands away from your face.

FIGURE II TYPES OF ACNE

2.3 SKIN AGING:

2.3.1 ETIOLOGY:

Skin changes are among the most visible signs of aging. Evidence of increasing age includes wrinkles and sagging skin. Whitening or graying of the hair is another obvious sign of aging.Skin changes are related to environmental factors, genetic makeup, nutrition, and other factors. The greatest single factor, though, is sun exposure. You can see this by comparing areas of your body that have regular sun exposure with areas that are protected from sunlight.Natural pigments seem to provide some protection against sun-induced skin damage. Blue-eyed, fair-skinned people show more aging skin changes than people with darker, more heavily pigmented skin.With aging, the outer skin layer (epidermis) thins, even though the number of cell layers remains unchanged.The number of pigment-containing cells (melanocytes) decreases. The remaining melanocytes increase in size. Aging skin looks thinner, paler, and clear (translucent). Pigmented spots including age spots or "liver spots" may appear in sun-exposed areas. The medical term for these areas is lentigos.Changes in the connective tissue reduce the skin's strength and elasticity. This is known as elastosis.

It is more noticeable in sun-exposed areas (solar elastosis). Elastosis produces the leathery, weather-beaten appearance common to farmers, sailors, and others who spend a large amount of time outdoors.The blood vessels of the dermis become more fragile[8]. This leads to bruising, bleeding under the skin (often called senile purpura), cherry angiomas, and similar conditions. Sebaceous glands produce less oil as you age. Men experience a minimal decrease, most often after the age of 80. Women gradually produce less oil beginning after menopause. This can make it harder to keep the skin moist, resulting in dryness and itchiness. The subcutaneous fat layer thins so it has less insulation and padding. This increases your risk of skin injury and reduces your ability to maintain body temperature. Because you have less natural insulation, you can get hypothermia in cold weather. Some medicines are absorbed by the fat layer. Shrinkage of this layer may change the way that these medicines work.The sweat glands produce less sweat. This makes it harder to keep cool. Growths such as skin tags, warts, brown rough patches (seborrheic keratoses), and other blemishes are more common in older people. Also common are pinkish rough patches (actinic keratosis) which have a small chance of becoming a skin cancer.

Other causes of skin changes:

- Allergies to plants and other substances[9]
- Climate
- Clothing
- Exposures to industrial and household chemicals.
- Indoor heating

Sunlight can cause:

- Loss of elasticity (elastosis)
- Noncancerous skin growths (keratoacanthomas)
- Pigment changes such as liver spots
- Thickening of the skin

Sun exposure has also been directly linked to skin cancers, including basal cell cancer, squamous cell carcinoma, and melanoma.

FIGURE III IMPACT ON SKIN

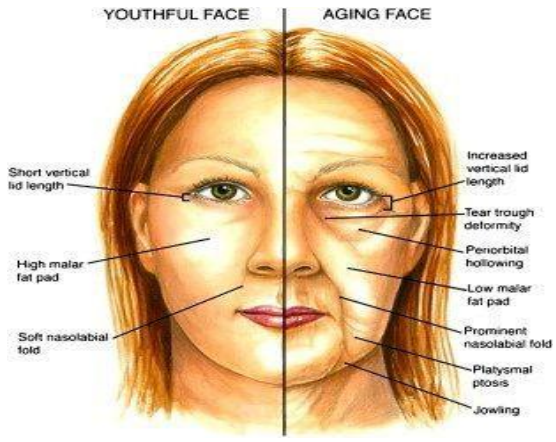


FIGURE IV AGING

2.3.2 PREVENTION[10]

Because most skin changes are related to sun exposure, prevention is a lifelong process.

- ✓ Prevent sunburn if at all possible.
- ✓ Use a good quality sunscreen when outdoors, even in the winter.
- ✓ Wear protective clothing and a hat when needed.
- ✓ Good nutrition and adequate fluids are also helpful.
- ✓ Dehydration increases the risk of skin injury.
- ✓ Sometimes minor nutritional deficiencies can cause rashes, skin lesions, and other skin changes, even if you have no other symptoms.
- ✓ Keep skin moist with lotions and other moisturizers.
- ✓ Do not use soaps that are heavily perfumed.
- ✓ Bath oils are not recommended because they can cause you to slip and fall.
- ✓ Moist skin is more comfortable and will heal more quickly.

FIGURE V AGING SPOTS

2.4 WRINKLES[11]:

2.4.1 ETIOLOGY:

Wrinkles are creases, folds, or ridges in the skin. They naturally appear as people get older. The first wrinkles tend to appear on a person's face in areas where the skin naturally folds during facial expressions. They develop due to the skin becoming thinner and less elastic over time. Wrinkles also tend to appear on parts of the body that receive most sun exposure, such as the face and neck, back of the hands, and arms. Wrinkles are a natural part of growing older, and they affect everyone. This article looks at why people get wrinkles, what causes them, and what increases their appearance. It also looks at some methods that people use to reduce wrinkles, some of which are more effective than others. As people get older, their skin becomes thinner, drier, and less elastic, which means it is less able to protect itself from damage. This leads to wrinkles, creases, and lines on the skin. Facial expressions, such as smiling, frowning, or squinting, lead to the development of fine lines and wrinkles at a young age. These lines deepen as the person gets older.

When a person is young, their skin springs back. As they get older, the skin loses its flexibility, and it becomes more difficult for the skin to spring back, resulting in permanent grooves. Wrinkles affect people of different skin tones differently due to structural and functional differences in the skin. Indicates that the compact dermis is thicker in the skin of Black and Asian people, which likely protects against facial wrinkles.

Many factors affect the development of wrinkles, including:

- sun exposure
- smoking
- dehydration
- some medications
- environmental and genetic factors

Exposure to ultraviolet (UV) light from sunbathing[11], tanning booths, and outdoor sports increases the development of wrinkles. UV light breaks down the collagen and elastin fibers in the skin. These fibers form the connective tissue that supports the skin. As this layer breaks down, the skin becomes weaker and less flexible. The skin starts to droop, and wrinkles appear.Darker skin contains more melanin and protects from many harmful effects of UV radiation.People who work in sunlight have a higher chance of early wrinkles. Wearing clothes that cover the skin, such as hats or long sleeves, may delay the development of wrinkles. Regular smoking accelerates the aging process of skin because it reduces the blood supply to the skin. Alcohol dehydrates the skin, and dry skin is more likely to develop wrinkles.

2.4.2 TREATMENT:

There are many treatments available to help reduce fine lines on the skin. For deeper creases, a person may require more aggressive techniques, such as plastic surgery or injections of fillers.

2.4.3 PREVENTION:

Everybody gets wrinkles and lines that become more prominent over time. Some ways to prevent or reduce their development include:

- Using sun protection. Avoiding UV exposure reduces skin damage. Dermatologists recommend wearing a hat and clothing to protect the skin and using a sunscreen of SPF 30 or higher every day.
- Moisturizing regularly. Moisturizing prevents dryness, which reduces the chance of wrinkles forming.
- Quitting smoking. Smoking greatly speeds up skin aging and causes skin wrinkles.
- Drinking less alcohol. Alcohol dehydrates the skin, which causes damage over time.
- Eating a healthful, balanced diet. Eating plenty of fruit and vegetables can prevent skin damage, whereas sugar and refined carbs can speed up skin aging.
- Washing your face twice a day. Use a gentle cleanser. Rubbing the skin can cause irritation and speed up skin aging.
- Washing your face after heavy sweating. Sweat can irritate the skin, causing damage over time. This is especially true when wearing a hat or helmet.

FIGURE VI TYPES OF WRINKLES

2.5 EFFECT OF UV RAYS:

Energy from the sun reaches the earth as visible, infrared, and ultraviolet (UV) rays[12].

- Ultraviolet A (UVA) is made up of wavelengths 320 to 400 nanometers (nm) in length.
- Ultraviolet B (UVB) wavelengths are 280 to 320 nm in length.
- Ultraviolet C (UVC) wavelengths are 100 to 280 nm in length.

Only UVA and UVB ultraviolet rays reach the earth's surface. The earth's atmosphere absorbs UVC wavelengths.

- UVB rays cause a much greater risk of skin cancer than UVA. However, UVA rays cause aging, wrinkling, and loss of elasticity.
- UVA also increases the damaging effects of UVB, including skin cancer and cataracts (an eye disorder characterized by a change in the structure of the crystalline lens that causes blurred vision).

In most cases, ultraviolet rays react with a chemical called melanin, that is found in the skin. This is the first defense against the sun, as it is the melanin that absorbs the dangerous UV rays that can do serious skin damage. A sunburn develops when the amount of UV damage exceeds the protection that the skin's melanin can provide. While a small amount of exposure to sunlight is healthy and pleasurable, too much can be dangerous. Measures should be taken to prevent overexposure to sunlight in order to reduce the risks of cancers, premature aging of the skin, the development of cataracts, and other harmful effects.

TABLE I INDEX VALUES AND EXPOSURE CATEGORY OF UV RAYS

INDEX VALUES	**EXPOSURE CATEGORIES**[12]
0-2	Minimal—An index reading of 0 to 2 means minimal danger from the sun's UV rays for the average person.
3-4	Low—An index reading of 3 to 4 means you may be at risk of skin damage from the sun's rays. Many people can experience a sunburn in 45 minutes.
5-6	Moderate—An index reading of 5 to 6 means you may be at some measurable risk of skin damage due to the sun. Many people can experience a burn in only 30 minutes.
7-9	High—An index reading of 7 to 9 means you may be at high risk of harm from unprotected exposure to the sun. Many people can burn in under 15 minutes.
10+	Very High—An index reading of 10 and above means you are at maximum risk of harm from unprotected sun exposure. Many people burn in as little as 10 minutes without protection.

2.5.1 EFFECTS OF UV EXPOSURE ON SKIN:

FIGURE VII IMPACT OF UV ON SKIN WITH AND WITHOUT PROTECTION

FIGURE VIII TANNING AND SUNBURN DUE TO UV EXPOSURE

2.5.2 SKIN CANCER

Consider the following statistic related to skin cancer:

- More than 1 million cases of non-melanoma skin cancer are diagnosed in the US each year.
- Most skin cancers appear after age 50, but skin damage from the sun begins at an early age. Therefore, protection should start in childhood to prevent skin cancer later in life.

2.5.3 PREMATURE AGING (PHOTOAGING) [12]

Sun exposure also causes premature aging of the skin, a condition called photoaging, which is different than chronological aging.

- People who sunbathe regularly show photoaging early in life - often before 30 years of age.
- Chronologically-aged skin, more often, shows changes after age 40 or older.
- Freckling, fine wrinkling, and dilation of capillaries are often seen early in the photoaging process.
- Photoaged skin often develops irregular pigmentation (liver spots) in later years.
- Both photoaging and chronological aging cause wrinkling and loss of skin elasticity. However, these changes occur much earlier when skin has been overexposed to the sun.

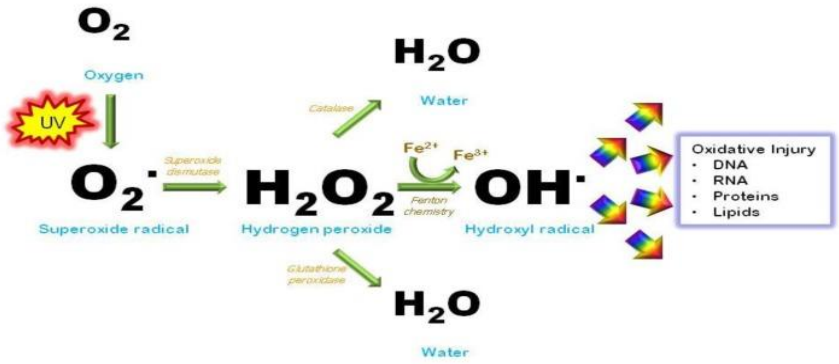


FIGURE IX FREE RADICAL FORMING MECHANISM DUE TO UV

2.5.4 CATARACTS AND OTHER EYE DISORDERS[12]

Cataracts, an eye disorder characterized by a change in the structure of the crystalline lens that causes blurred vision, are a leading cause of blindness around the world - and excessive UV exposure is one of the risk factors in the development of cataracts. In fact, persons who spend more time in the sun may develop cataracts earlier than others. The American Academy of Ophthalmology now recommends wearing UV sunglasses and a wide brimmed hat to lessen exposure to ultraviolet rays. Corneal sunburn, growths on the outer surface of the eye, retinal-tissue damage, and other eye diseases are also known, or suspected, to be related to long-term exposure to UV rays.

2.5.5 IMMUNE SYSTEM DAMAGE

The skin is part of the body's natural defense system. Many healthcare professionals believe that UV radiation can alter immune system functions. When UV radiation suppresses immune responses, the body's ability to fight certain diseases, including skin cancer, is reduced. It is suspected that overexposure to UV radiation also interferes with the effectiveness of immunizations given through the skin.

2.5.6 Sunscreens can help : Studies have shown that sunscreens can prevent UV-induced wrinkling. Animal studies demonstrated that sunscreens with adequate UVA coverage can prevent sagging and wrinkling due to high-intensity UVA.

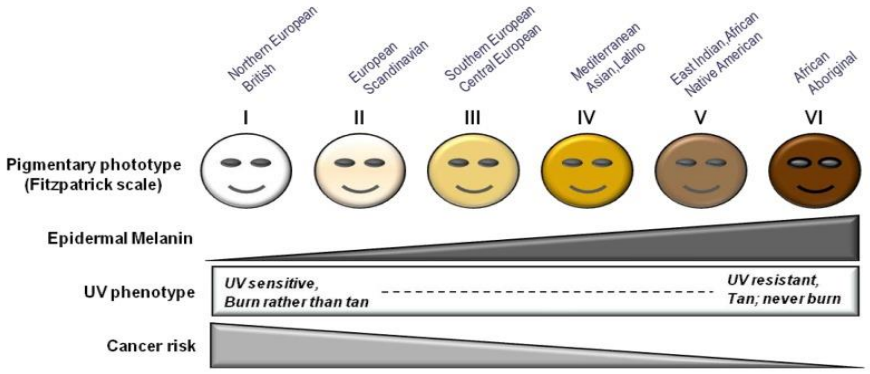


FIGURE X UV SENSITIVITY ACCORDING TO RACES

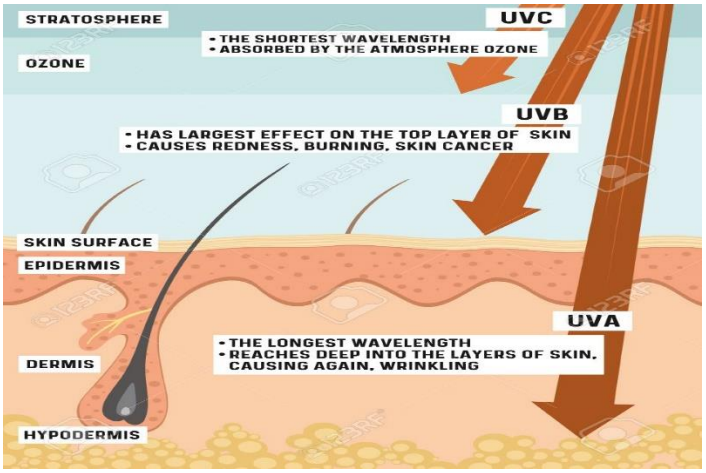


FIGURE XI IMPACT OF TYPES OF UV RAYS

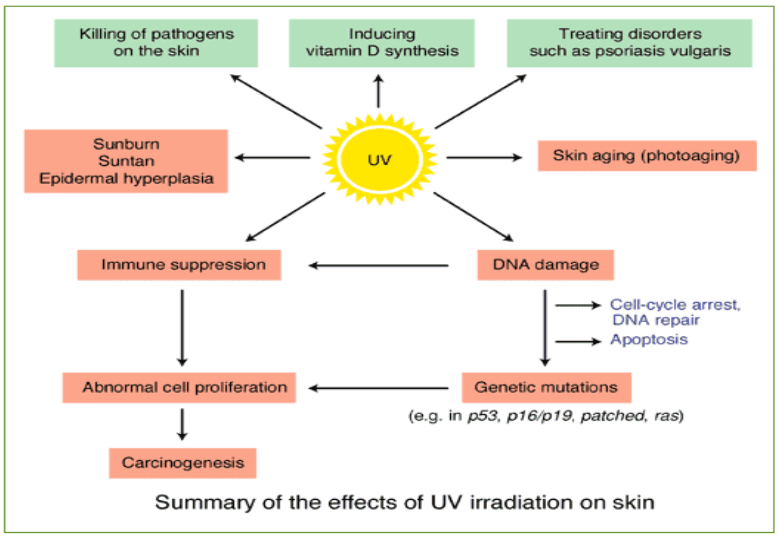


FIGURE XII SUMMARY OF THE EFFECTS OF UV IRRADIATION ON SKIN

III. EXTRACTION

Extraction is the method of removing active constituents from a solid or liquid by means of liquid solvent.
It is the separation of medicinally active portions of plant or animal tissues from the inactive or inert components by using selective solvents.

Extract: Extracts can be defined as preparations of crude drugs which contain all the constituents which are soluble in the solvent.
Marc: Solid residue obtain after extraction.
Menstruum: Solvent used for extraction.

Extracts are prepared by using ethanol or other suitable solvent.

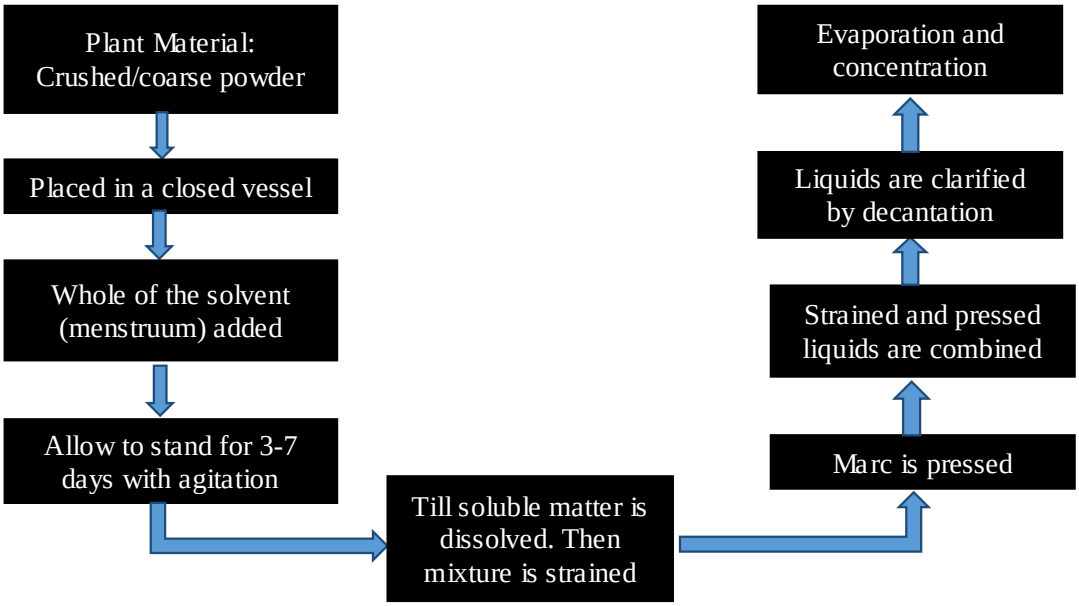
There are different types of extraction[13]:-

- ✓ Infusion
- ✓ Decoction
- ✓ Digestion
- ✓ Maceration
- ✓ Percolation
- ✓ Continuous hot extraction
- ✓ Supercritical fluid extraction
- ✓ Counter current extraction
- ✓ Microwave assisted extraction
- ✓ Ultrasonication-Assisted Extraction

MACERATION :

In this process solid ingredients are placed in a stoppered container with the whole of the solvent and allowed to stand for a period of at least 3 days (3 - 7 days) with frequent agitation, until soluble matter is dissolved. The mixture is then strained, the marc pressed and the combined liquids clarified or by decantation, after standing.

PROCESS OF MACERATION:-



Types of Maceration[13]:-

- Simple maceration
- Double maceration
- Triple maceration

Ex- Maceration of herbs

PERCOLATION :

It is continuous downward displacement of the solvent through the bed of crude drug material to get extract. Most frequently used to extract active ingredients in the preparation of tinctures and fluid extracts.

Steps in Percolation:-

TABLE II PERCOLATION STEPS

Size Reduction	The drug to be extracted is subjected to suitable degree of size reduction, from course to fine powder.
Imbibition	The powdered drug is moistened with a suitable amount of menstruum and allowed to stand for four hours in a well closed container.
Packing	The moistened drug is evenly packed into the percolator.

Maceration	After packing sufficient menstruum is added to saturate the material. The percolator is allowed to stand for 24 hours to macerate the drug.
Percolation	The lower tap is opened and liquid collected therein its allowed to drip slowly at a controlled rate until 3/4th volume of the finished product is obtained.

Types of percolation:-

- Simple percolation
- Modified percolation

Ex- Coffee percolation

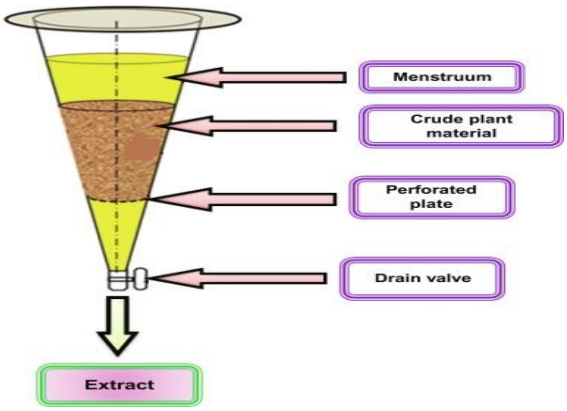


FIGURE XIII PERCOLATOR

SOXHALATION[13]

Working of Soxhlet Extractor-

- The solvent is heated to reflux.
- The solvent vapour travels up a distillation arm, and floods into chamber housing the thimble of solid.
- The chamber containing the solid material slowly fills with warm solvent.
- Compound dissolves in warm solvent.
- When soxhlet chamber is almost full, the chamber is emptied by siphon.
- Then solvent is returned to distillation flask.
- After extraction, the solvent is removed by Rotary Evaporator.
- The non soluble portion is discarded.

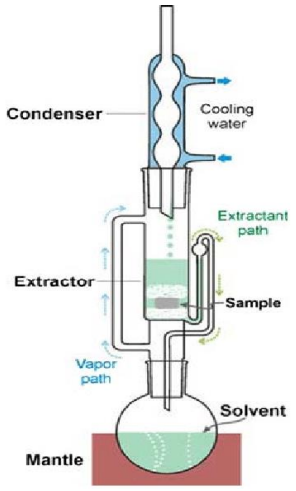


FIGURE XV SOXHLET EXTRACTOR

SUPERCRITICAL FLUID EXTRACTION[14]:

Supercritical fluid is any substance at a temperature and pressure above its critical point, where distinct liquid and gas phases don't exist.

Ex- Carbon Dioxide and water

Procedure :

The system must contain a pump for the CO2, a pressure to contain the sample, a means of maintaining pressure in the system and a collecting vessel. The liquid is pumped to a heating zone. It then passes onto the extraction vessel and dissolves material to be extracted. Extracted material settles out.

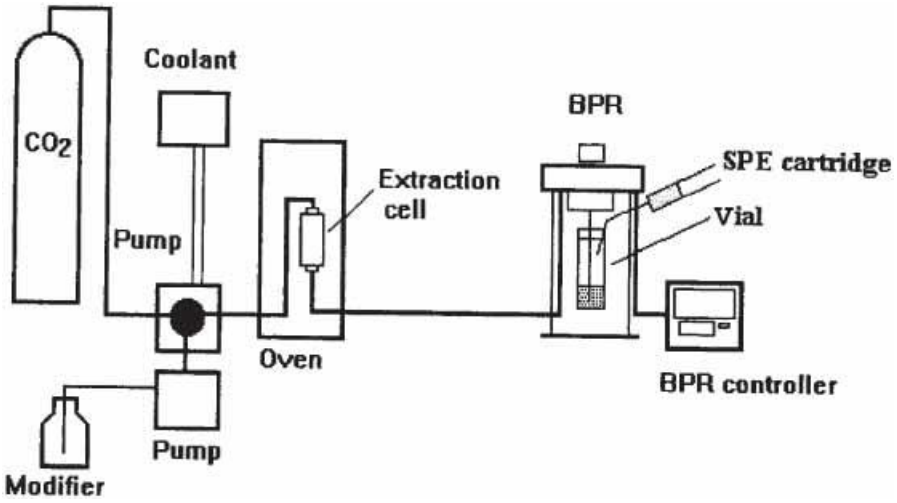


FIGURE XVI SUPER-CRITICAL FLUID EXTRACTION

Applications:-

- Separations of biological fluids
- Bioseparation
- Petroleum recovery
- Crude dewaxing
- Coal processing

COUNTER CURRENT EXTRACTION[13]:

In counter-current extraction wet raw material is pulverized using toothed disc disintegrators to produce fine slurry. The material to be extracted is moved in one direction within a cylindrical extractor where it comes in contact with extraction solvent. The further the starting material moves, the more concentrated the extract becomes. Finally, sufficiently concentrated extract comes out at one end of the extractor while the marc falls out from the other end.

Ex- DNA Purification, Food industry, citrus oil processing.

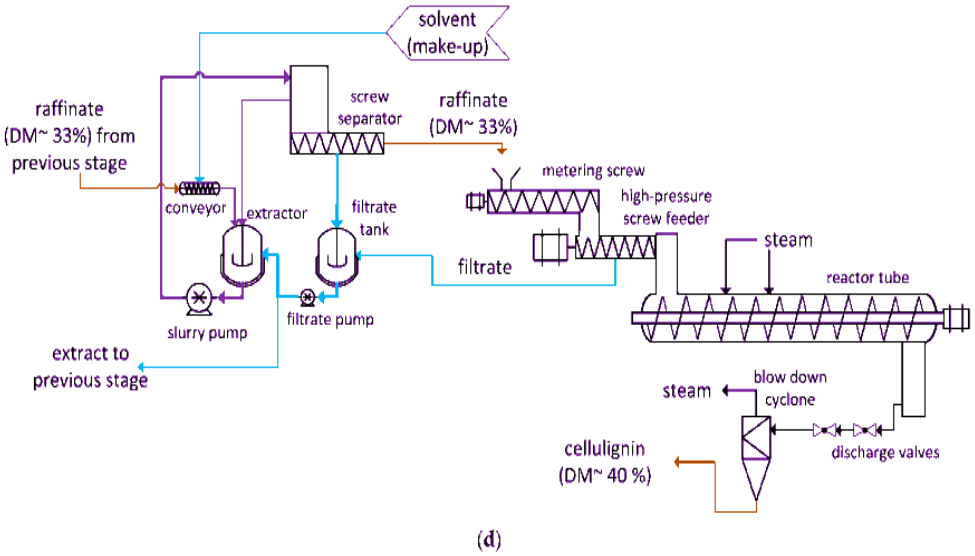


FIGURE XVII COUNTER CURRENT EXTRACTION

MICROWAVE ASSISTED EXTRACTION :

Microwaves are electromagnetic radiations with a frequency from 0.3 to 300 GHz. In order to avoid interferences with radio communications, domestic and industrial microwaves generally operate at 2.45 GHz .

Procedure-

- Microwave-assisted extraction offers a rapid delivery of energy to a total volume of solvent and solid plant matrix with subsequent heating of the solvent and solid matrix, efficiently and homogeneously.
- Components of the sample absorb microwave energy in accordance to their dielectric constants.
- When plant material is immersed inside a microwave transparent solvent, the heat of microwave radiation directly reaches to the solid without being absorbed by the solvent, resulting in instantaneous heating of the residual moisture in the solid.
- Heating causes the moisture to evaporate and creates a high vapour pressure that breaks the cell wall of substrate and releases the content into solvent.
- The extracting selectivity and the ability of the solvent to interact with microwaves can be modulated by using mixtures of solvents.

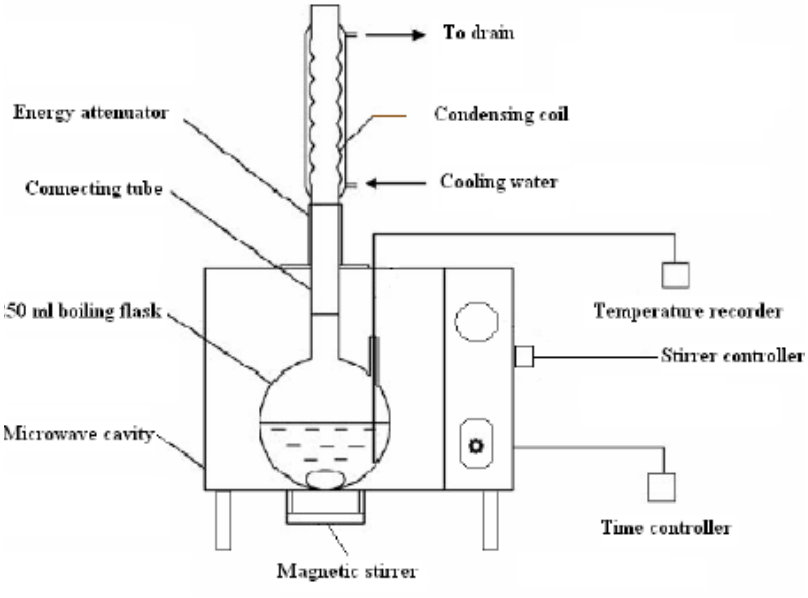


FIGURE XVIII MICROWAVE ASSISTED EXTRACTION

Ex:- Hexane- Acetone

Applications-

- Extraction of taxanes from Taxus brevifolia needles.
- Azadiractin related limonoids from Azadirachta indica seed kernels.
- Extraction of glycyrrhizic acid from Glycyrrhizia glabra roots.
- Extraction of artemisinin from Artemisia annua.

ULTRASONICATION ASSISTED EXTRACTION[13]:

The procedure involves the use of ultrasound waves, which have frequencies higher than 20 kHz.

Under ultrasonic action solid and liquid particles are vibrated and accelerated and, because of that solute quickly diffuses out from solid phase to solvent . Ultrasound assisted extractors are ultrasonic baths or closed extractors fitted with an ultrasonic horn transducer. The mechanical effects of ultrasound induce a greater penetration of solvent into cellular materials and improve mass transfer.

Applications-

Used to extract nutraceuticals from plants such as essential oils and lipids dietary supplements.

Ex- oils from almond, apricot and rice bran, Extraction of saponin from ginseng .

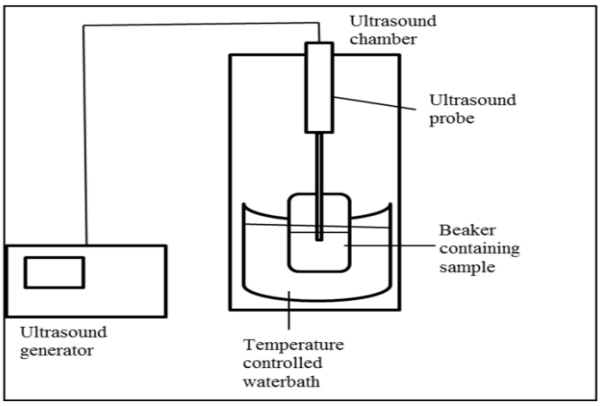


FIGURE XIX ULTRASONIC ASSISTED EXTRACTION

DISTILLATION[15]

Distillation is method of separating mixtures based on differences in their boiling point.

Parts of Distillation-

- Still- Source material is heated.
- Condenser- Heated vapour is cooled back to liquid state.
- Receiver- Liquid is collected.
- Distillate

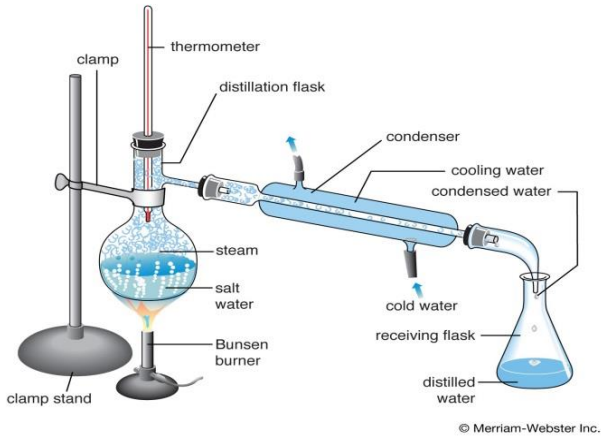


FIGURE XX DISTILLATION

Procedure-

- First, heat a liquid to its boiling point. Liquid evaporates forming a vapour.
- Vapour is then cooled, by passing it through pipes at low temperature. Cooled vapour condenses to form a distillate

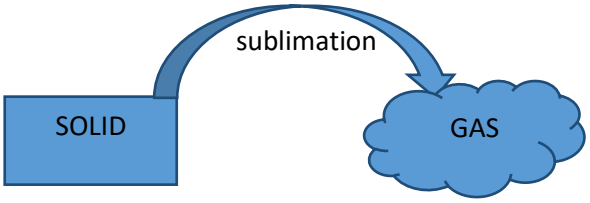
Applications-

- Distillation of fermented products produces distilled beverages with a high alcohol content.
- In petroleum industry, for oil stabilization.

SUBLIMATION[15]:

Sublimation is the transition of a substance directly from the solid to the gas phase without passing through the intermediate liquid phase.

Sublimation is an endothermic phase transition that occurs at temperatures and pressures below a substance's triple point.



CENTRIFUGATION[15]:

It is the process which separates materials suspended in a liquid medium.

Working-

- It involves the use of centrifugal force to separate particles from solution according to their size, shape, density.
- The denser components of mixture migrate away from the axis of centrifuge, while less dense components migrates towards axis. Remaining that lies above precipitated called supernatant.

FIGURE XXI CENTRIFUGE

IV. HERBAL API'S :

The main aim of our work is to develop a herbal cream which can give multipurpose effect like moisturizer , reduce acne and skin irritation , reduce dry skin , wrinkles etc and also add glow to face.

4.1 ALOE VERA[16]

FIGURE XXII ALOE VERA EXTRACT (KUWARPATHU , GHRITKUMARI)

Biological name : Aloe , Ghritkumari
Biological Source : Dried juice collected by incision from the leaves of various species of Aloe .
Geographical Source : Found in North Africa , West Indies .
Chemical Constituents : Contains 30% of aloin which is a mixture of 3 isomers barbaloin, betabarbaloin , isobarbaloin .

Uses[17]:

- ✓ Used in sunburns
- ✓ Thermal burns
- ✓ Radiation burns .
- ✓ Prevents skin ulceration
- ✓ Irritation and malignancy .

4.2 NEEM[18]:

FIGURE XXIII NEEM LEAF (AZADIRACHTA INDICA)

Biological Name : Azadirachta indica
Biological Source : It consists of leaves and other aerial parts of Azadirachta indica .
Geographical source : It grows in various tropical and subtropical regions , widely grown in India.
Chemical Constituents : Active ingredients are Azadirachtin , Salannin and Meliantriol .

Uses[19]:

- ✓ Antibacterial properties of neem fight acne causing bacteria .
- ✓ Pacify skin irritation .
- ✓ Fights signs of ageing .

4.3 CARROT SEED[20]:

FIGURE XXIV CARROT SEED (DAUCUS CAROTA)

Biological Name : Daucus carota
Biological Source : Seeds are formed from carpels. They are tiny and covered with a spiny, hooked, and slightly curved mericarp. The mericarp contains a characteristic oil which inhibits seed germination, requiring the removal of the mericarp before planting. Then the carrot is ready , it sends up a tall stem , which produces flowers , and eventually seeds.The seeds are brownish in colour and are very small , on average between 1mm and 2mm in length.

Uses:
Block sunlight. A compound called umbelliferone, or 7-hydroxycoumarin, is found in carrot seed essential oil. This compound absorbs UVB light and is commonly used in **sunscreens**. While carrot compounds are found in sunscreen, there's no evidence that carrot seed oil is safe to use alone as a

sunscreen. While it might block UVB light, no evidence shows that it can stop sunburns or sun damage, or protect against skin cancer.
Even skin tone. Because carrot seed oil absorbs **UVB light**, it might also help with hyperpigmentation.

4.4 LEMON PEEL[21]:

FIGURE XXV LEMON PEEL (CITRUS LIMONIS)

Biological name[22]: Citrus Limonis
Biological source: Lemon peel is the fresh or dried outer pericarp of citrus medica limonum linn.
Geographical Source : Native of India also cultivated in sub tropical countries like Spain , Sicily , Portugal , Jamaica . Also in California , Florida and Australia .
Chemical Constituents : Total volatile oil content is 2.5% . Citral constitutes 4% and lommonene 90%.

Uses:

- ✓ Lemon pill used as flavouring agent and in perfumery.
- ✓ Have anti-bacterial and anti-microbial properties which work well in treating acene and oily skin also have skin lightning agent which help to remove scarce and blemishes

4.5 CUCUMBER SEEDS[23]:

FIGURE XXVI CUCUMBER SEED (CUCUMIS SATIVUS)

Biolgical name: Cucumis sativus
Biological source: Cucumber (Cucumis sativus) is a widely-cultivated creeping vine plant in the Cucurbitaceae family that bears usually cylindrical fruits, which are used as vegetables.
Geographical source: Cucumber (Cucumis sativus) is a widely-cultivated creeping vine plant in the Cucurbitaceae family that bears usually cylindrical fruits, which are used as vegetables.
Chemical constituents: Raw cucumber (with peel) is 95% water, 4% carbohydrates, 1% protein, and contains negligible fat.

Uses:

- ✓ Reduces swelling and puffiness.
- ✓ Helps combact premature ageing.
- ✓ Soothes irritation.
- ✓ Provide base for hydration.

4.6 HONEY:

FIGURE XXVII HONEY

Geographical source[24]: Honey is produces in certain parts of West Indies, California, Chile, Africa, Australia, and New Zealand and also in India.

Chemical constituent : In general, honeys contain a large amount of carbohydrates about 80% (about 32.3% glucose and 38.6% fructose) and more than four hundred different minor substances such as aroma constituents, enzymes and proteins (about 0.2%), minerals (about 0.1%), vitamins, organic acids, pigments, and waxes (Kagawa 2017).

Uses:

- ✓ Moisturises the skin deeply
- ✓ Act as a pore clenser
- ✓ Useful in sunburn
- ✓ Reverses age
- ✓ Adds natural glow

4.7 VETIVER[25]:

FIGURE XXVIII VETIVER ROOT (CHRYSOPOGON ZIZANIOIDES)

Biological name: Chrysopogon zizanioides

Geographical source: Khus or Vetiveria zizanioides is native to India.

It belongs to Poaceae family which includes India's staple food grain, wheat, and grows wild in the northern states. In southern states, farmers cultivate it as a commercially traded grass—its scientific name, in fact, comes from the Tamil name for the grass, vettivar.

Chemical constituent[26]: Firstly, for the root oil from traditional hydrodistillation, 21 volatiles were observed with three main chemical compounds, cedr-8-en-13-ol (26.54%), β-guaiene (15.31%), and cycloisolongifolene (11.09%).

Uses:

- ✓ Remove Blemishes And Pigmentation
- ✓ Cooling properties
- ✓ Antioxidant
- ✓ Balances pH

4.8 GINSENG[27]:

FIGURE XXIX PANAX GINSENG ROOT

Biological name: Panax ginseng

Biological source[28]: It consists of dried roots of Panax ginseng C.A. Mey and other species of Panax like Panax japonicus (Japanese Ginseng), Panax pseudoginseng (Himalayan Ginseng), Panax quinque-folius (American Ginseng), Panax trifolius (Dwarf Ginseng) and Panax vietnamensis (Vietnamese Ginseng), belonging to family Araliaceae.

Geographical Source: Ginseng is found in cooler climates – Korean Peninsula, Northeast China, and Russian Far East, Canada and the United States, although some species grow in warm regions – South China ginseng being native to Southwest China and Vietnam. Panax vietnamensis (Vietnamese ginseng) is the southernmost Panax species known.

Chemical constituent[29]: Several saponin glycosides belonging to triterpenoid group, ginsenoside, chikusetsusaponin, panxoside. More than 13 ginsenosides have been identified. Ginsenosides consists of aglycone dammarol where as panaxosides have oleanolic acid as aglycone. It also contains large

amount of starch, gum, some resin and a very small amount of volatile oil.

Uses:

- ✓ Boost the circulation of the blood vessels.
- ✓ Reducing fine lines and wrinkles.
- ✓ Improves Skin Texture.
- ✓ Multiple Antioxidant Properties.

4.9 GINKGO[30]:

FIGURE XXX GINKGO BILOBA LEAF

Biological name: Ginkgo biloba
Biological source: The leaves of Ginkgo are obtained from the dioeceous tree Ginkgo biloba, belonging to family Ginkgoaceae.
Geographical Source: It is a native to China and Japan and cultivated ornamentally in many temperate regions.
Chemical Constituents: The diterpene lactones and flavonoids possess therapeutic activity. Five diterpene lactones (ginkgolides A, B, C, J, M) have been characterized; these have a cage structure involving a tertiary butyl group and six 5-membered rings including a spirononane system; a tetrahydrofuran moiety and three lactonic groups. These compounds are platelet-activating factor (PAF) antagonists and as they do not react with any other known receptor, their effect is very specific. A tertiary butyl group is present in the sesquiterpene bilo-balide; no PAF-antagonist activity has been demonstrated for this compound.

Uses:

- ✓ Antioxidant protection.
- ✓ Skin-soothing effects.
- ✓ Increased skin-hydration.
- ✓ Anti-aging defense.

4.10 ROSE[31]:

FIGURE XXXI ROSE (ROSA)

Biological name : Rosaceace
Geographical Source : Most species are native to Asia with smaller numbers native to Europe , North America and Northwesrern Africa .

Uses :

- ✓ Has variety of vitamins , antioxidants and minerals for tackling dry skin.
- ✓ Excellent combactant of redness and inflammation .

V. EXTRACTION OF HERBAL INGREDIENTS FOR FORMULATION

FIGURE XXXII RAW HERBAL API

Types of solvents used for extraction-

- Ethanol
- Methanol
- Water
- Acetone

Properties of ideal solvents[13]-

- Be highly selective for the compound to be extracted.
- Have a high capacity for extraction in terms of coefficient of saturation of the compound in the medium.
- Not react with the extracted compound or with other compounds in the plant material.
- Have a low price.
- Be harmless to human being and to the environment.
- Be completely volatile.

EXTRACTION PROCESS OF HERBAL API[32]

Extraction of Daucus carota and Cucumis sativus seed:

Firstly, the seeds were triturated in a mortar and pestle to make a powder form. Then accurately weigh 5gm of powder on a weighing balance. Put the powder into a conical flask and add 50ml Methanol. Shake it well. Put the conical flask on a Hot plate and let it evaporate for 1hr.

Citrus limon peel , Azadirachta indica , Panax ginseng , Ginkgo biloba , Chrysopogon zizanioides powder :

Accurately weigh 5gm of lemon peel powder on a weighing balance. Put the powder in a conical flask and add 50ml methanol. Shake it well. Put the conical flask on hot plate and let it evaporate for 1hr.

FIGURE XXXIII EXTRACTS OBTAINED

Final concentration of herbal extracts:

TABLE III CONCENTRACTION OF HERBAL API USED

	Ingredients	Weight	%
I.	Daucus carota seed	2gm	2%
II.	Cucumis sativus seed	0.5gm	0.5%
III.	Citrus limon peel	2gm	2%
IV.	Azadirachta indica powder	1gm	1%
V.	Panax ginseng powder	3gm	3%
VI.	Ginkgo biloba powder	3gm	3%
VII.	Chrysopogon zizanioides powder	2gm	2%
VIII.	Rosa indica powder	2gm	2%
IX.	Aloe barbadensis extract	10gm	10%
X.	Honey	2gm	2%
XI.	Vit E	3gm	3%

FIGURE XXXIV STORAGE OF EXTRACTS BEFORE EVAPORATION

Mix all the herbal ingredients in same concentrations as given in table. Then evaporate it on a hot plate till some time and then add the result in the formulation.

FIGURE XXXV EVAPORATION OF EXTRACTS ACCORDING TO WEIGHED QUANTITY

FIGURE XXXVI EVAPORATION USING HOT PLATE

FIGURE XXXVII SCRAPPED API AFTER EVAPORATION

VI. EXCIPIENTS USED IN FORMULATION[32]:

The base of cream is made up of Two phase.

- ✓ Water phase
- ✓ Oil phase

1. Water phase:

These phase contains following ingredients

- ✓ Hydrogenated vegetable oil (olive oil)
- ✓ Propylene Paraben
- ✓ Methyl Paraben
- ✓ Polyethylene glycol 4000
- ✓ Citric acid
- ✓ Water

2. Oil phase:

These phase contains following ingredients

- ✓ Polyethylene glycol 4000
- ✓ Liquid Paraffin
- ✓ Stearic acid
- ✓ Ceto stearyl alcohol

6.1 Hydrogenated vegetable oil (olive oil)[33]:

Botanical Name: Olea europaea

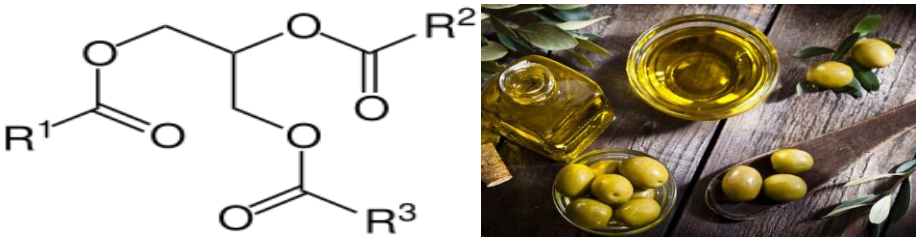


FIGURE XXXVIII OLIVE OIL

Formula: C88H164O10

6.2 Propylene Paraben[34]:

Formula: C10H12O3

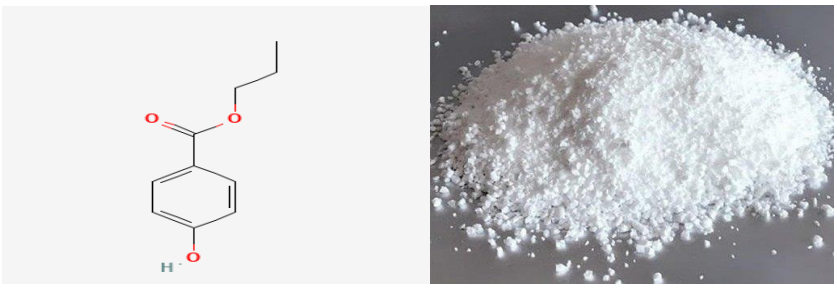


FIGURE XXXIX PROPYL PARABEN

6.3 Methyl paraben[35]:
Formula: C8H8O3
Appearance: Colorless crystals or white crystalline powder

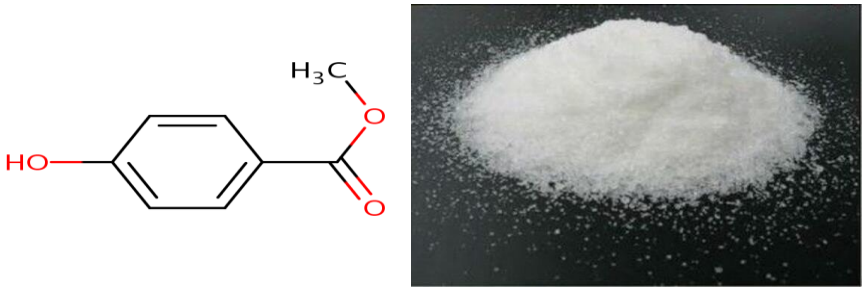


FIGURE XL METHYL PARABEN

6.4 Polyethylene glycol 4000[36]:
Formula: C2nH4n+2On+1

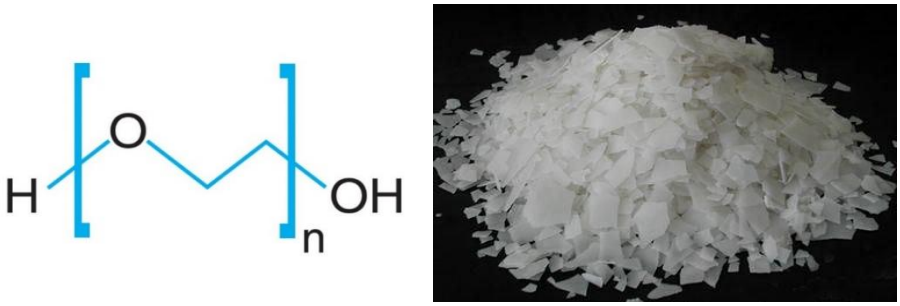


FIGURE XLI PEG 4000

6.5 Citric acid[37]:
Formula: $C_6H_8O_7$

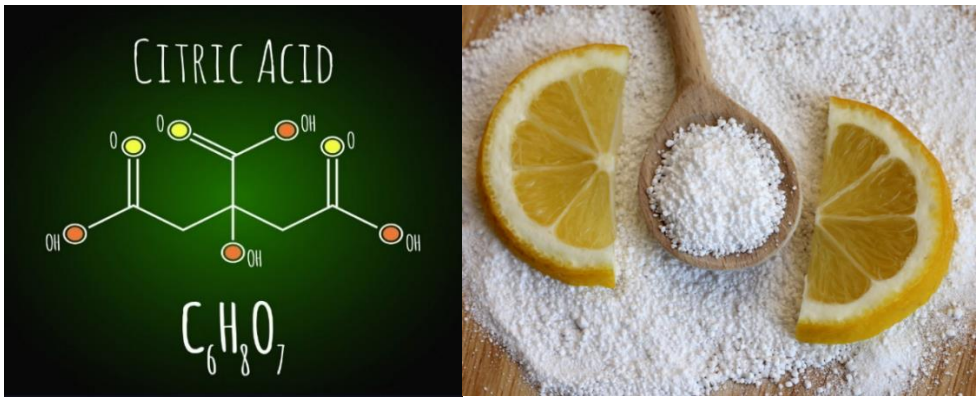


FIGURE XLII CITRIC ACID

6.6 Liquid paraffin[38]:
Formula: CnH2n+2

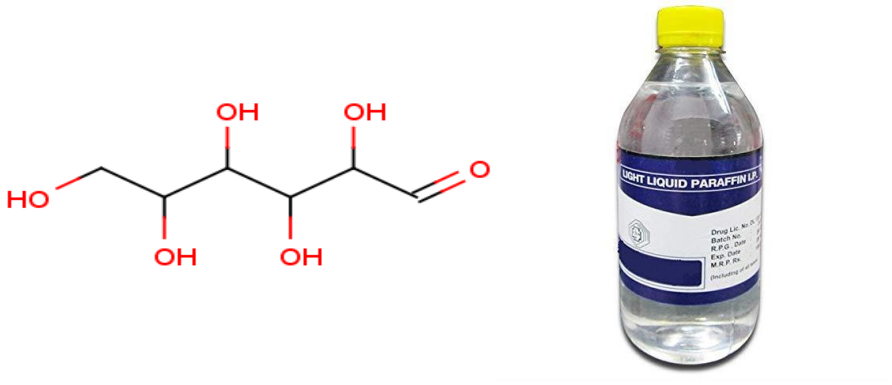


FIGURE XLIII LIGHT LIQUID PARAFFIN

6.7 Stearic acid[39]:
Formula: C18H36O2

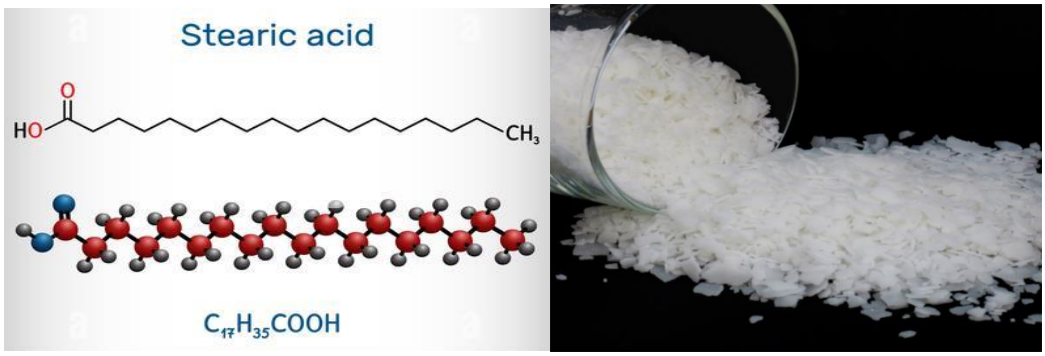


FIGURE XLIV STEARIC ACID

Melting point: 69.3 °C

6.8 Ceto Stearyl alcohol[40]:
Formula: CH3(CH2)nOH
Melting point: 50 °C

FIGURE XLV CETO STEARYL ALCOHOL

VII. PREPARATION OF BASE[41][42]:

Preparation of base is done in two phases and it is o/w emulsion.
This gives a hydrated feeling and is non sticky.

7.1 Water Phase ingredients:

TABLE IV INGREDIENTS OF WATER PHASE , IT'S ROLE AND IMPACT ON SKIN

Name of ingredients	Role of ingredients	Concentration	Impact on skin
Olive oil (Hydrogenated vegetable oil)	Humectant , moisturizer	0.5gm	Maintains moisture
Propyl paraben	Preservative	0.02gm	Increases shelf life of product
Methyl paraben	Preservative	0.05gm	Enhances effect of propyl paraben
PEG 4000	Co-emulsifier	0.05gm	Stabilizes moisture , gives pleasant feeling and acts as softner
Citric acid	Buffer	0.1gm	Clean pores , soften and even skin tone
Water	Base	40.6gm	Hydration of skin

FIGURE LIII INGREDIENTS OF WATER PHASE

7.2 Oil Phase Ingredients:

TABLE V INGREDIENTS OF OIL PHASE , IT'S ROLE AND IMPACT ON SKIN

Name of ingredients	Role of ingredients	Concentration	Impact on skin
PEG 4000	Co-emulsifier	3gm	Stabilizes moisture , gives pleasant feeling and acts as softner
Light Liquid Paraffin	Base	15gm	Soothing , Moisturizing , conditioning and protects loss of moisture
Stearic acid	Emulsifier , stabilizer , hardening agent	3gm	Softens skin and gives cooling sensation
Cetostearyl alcohol	Co-Emulsifier , gives shine to cream	5gm	Moistens skin and hardens cream

FIGURE LIV INGREDIENTS OF OIL PHASE

VIII. PROCEDURE[32]:

8.1 Phase A (Water Phase)[42]

Take accurately weighted Olive Oil and dissolve it in 50% quantity of deionized water using mechanical stirrer . Till phases mix together. Take another 50% of deionized water and add propyl paraben , methyl paraben , citric acid and PEG 4000 under constant stirring at 250-300 rpm. Addition of Olive oil based water solution under continuous stirring.

FIGURE LV MIXING OF TWO PARTS OF WATER

8.2 Phase B (Oil Phase)[32][42]

Take accurately weighed Cetostearyl Alcohol and melt it at 70 C . Addition of stearic acid and PEG 4000 and continuous melting it at 70 C . Add light liquid paraffin oil to above melted mixture . Heat the Phase A at 70 C . Slowly start addition of Phase A into Phase B under continuous homogenization. Homogenization of entire content for the next 15min. Allow the entire content to cooled down at RT .

FIGURE LVI MIXING OF TWO PHASES

8.3 TRIAL AND ERROR METHOD OF FORMULATION BASE PREPARATION[32][43]:

TABLE VI DIFFERENT FORMULATION OF PLACEBO PREPARATION

Ingredients	Formula 1	Formula 2	Formula 3	Formula 4	Formula 5	Formula 6	Formula 7	Formula 8	Formula 9
Water Phase									
Olive oil	0.5	1	0.5	0.5	0.5	0.5	1	1	0.5
Propyl paraben	0.02	0.02	0.02	0.02	0.02	0.02	0.05	0.02	0.02
Methyl paraben	0.05	0.05	0.05	0.05	0.05	0.05	-	0.05	0.05
PEG 4000	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Citric acid	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Water	40.6	40.6	40.6	40.6	40.6	30	30	30	40.6

Oil Phase									
PEG 4000	3	3	2	3	3	3	3	3	-
Light liquid paraffin	15	15	15	15	10	15	10	15	15
Stearic acid	3	3	4	6	3	3	3	3	3
Cetostearyl alcohol	5	5	6	5	5	5	5	5	5
Result of change	**Perfect formulation**	**Granules in formulation**	**Runny formulation**	**Hard formulation**	**Separation of water phase**	**Separation of oil phase**	**Formation of granules**	**Greasiness appears , turns sticky**	**Hardens formulation**

8.4 Addition of extract to the base :

Prepared extract is added to base made using formulation 1. It is mixed well using homogenizer.
The final formulation is as below .

FIGURE LVII MIXING OF PLACEBO WITH API

FIGURE LVIII HOMOGENIZING PARTICLES

FIGURE LIX HIGH SPEED HOMOGENIZER TO COVERT INTO MICRO-FORMULATION

TABLE VII FINAL FORMULATION OF CREAM

Ingredients	Concentration
Herbal API	
Daucus carota (Carrot seed powder extract)	2gm
Citrus limon (Lemon peel powder extract)	2gm
Azadirachta indica (Neem leaf powder extract)	1gm
Cucumis sativus (Cucumber seed powder extract)	0.5gm
Rosa (Rose petal powder extract)	2gm
Chrysopogon zizanioides (Vetiver root powder extract)	2gm
Panax Ginseng root powder extract	3gm
Ginkgo Biloba leaf powder extract	3gm
Aloe barbaris extract (fresh)	10gm
Honey (pure)	2gm
Tocopherol (Vitamin E)	3gm
Vanilla essential oil (perfuming agent)	0.5gm
Water Phase	
Olea europaea (Olive oil)	0.5gm
Propyl paraben	0.02gm
Methyl paraben	0.05gm
PEG 4000	0.05gm
Citric acid	0.1gm
Distilled water (qs)	40.6gm
Oil Phase	
PEG 4000	2gm
Light Liquid Paraffin	15gm
Stearic acid	3gm
Cetostearyl alcohol	5gm

IX. EVALUATION PARAMETER :

9.1 Physical evaluation[43]:

Tests	Results
Colour	Ivory
Odour	Pleasant
Appearance	Shiny and smooth
State	Semi-solid

9.2 Thermal stability[42]:

The thermal stability of formulation was determined using humidity chamber controlled at 60-70% RH and 37+- 1 C.

Result:

Formulation was found to be stable at 60-70% RH and 37+- 1 C.

9.3 pH[43]:

0.5gm cream was taken and dispersed in 50ml distilled water and pH was checked using digital pH meter.

Result: pH was nearly equal to skin pH nearly between 4.5 – 6.

FIGURE LX PH TEST

9.4 Patch test[42]:

About 1-3 gm of material to be tested was placed on a piece of fabric or funnel and applied to the sensitive part of the skin Eg: skin behind ears.

The cosmetic to be tested was applied to an area of 1sq m of the skin .

Control patches were also applied .

The site of patch is inspected after 24hrs.

Result: No redness , edema , inflammation and irritation.

9.5 Spread ability test[42]:

An important criteria for semisolids is that it posses good spreadability . It is a term expressed to denote the extent of area to which the cream readily spreads on application to the skin. The therapeutic efficacy of a formulation also depends on its spreading value. A special apparatus has been designed to study the spreadability of the formulations.It is expressed in terms of time in seconds taken by two slides to slip off from the formulation , placed between , under the application of acertain load . Lesser the time taken for the separation of the two , better the spreadability . To glass slides of standard dimensions were selected . The formulation whose spreadability had to be determined was placed over one of the slides . The other slide was placed on top of the formulations was sandwiched between the two slides across the length of 5cm along the slide . 100gm weight was placed up on the upper slide so that the formulation between the two slides was pressed uniformly to form a thin layer . The weight was removed and the excess of formulation adhering to the slided was scrapped off. One of the slides was fixed on which the formulation was placed . The second movable slide was placed over it , with one end tied to a string to which load could be applied by the help of a simple pulley and a pan. A 30gm weight was put on the pan and the time taken for the upper slide to travel the distance of 5cm and separate away from the lower slide under the direction of the weight was noted . The spreadability was the calculated from the following formula :

$$\textbf{Spreadability} = m * l / t$$

Where ,

m = weight tied to the upper slide (30gm)

l = length of glass slide (5cm)

t = time taken in seconds

Result: 30*5/9 = 16.66 gm cm/ sec

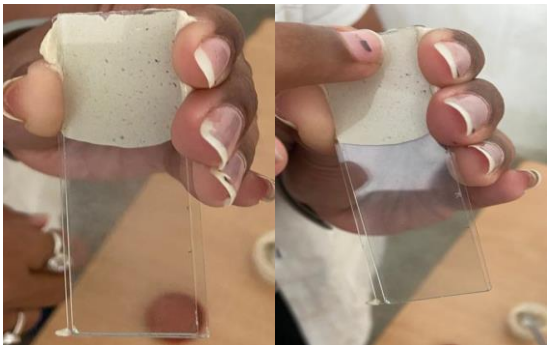


FIGURE LXI SPREADABILITY TEST

9.6 Microbial growth[42]:

The formulated creams were inoculated on the plates of agar media by streak plate method by incolutanig propionibacterium acen and a control was prepared by omitting the cream .

The plates were placed in to the incubator and are incubated at 37 C for 24hrs .

After the incubation period , plates were taken out and check the microbial growth by comparing it with the control.

Result: There was no growth of bacteria

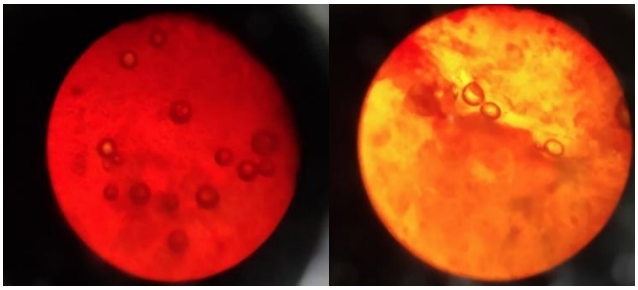


FIGURE LXII CONTROLLED SAMPLE
FIGURE LXIII TEST

9.7 Irritancy[43]:

Mark the area (1cm sq) on the left hand dorsal surface .

Then the cream was applied to that area and the time was noted .

Then it is checked of irritancy , erythema and edema if any for an interval upto 24hr and reported .

Result: No sign of irritancy , erythema and edema.

9.8 Washability[43]:

Small amount of cream was applied on hand and it was then washed with tap water.

Result: Easily washable under tap water.

9.9 Viscosity[43]:

Viscosity of cream was done by using Brooke field viscometer at temperature 25 C using spindle No 63 at 50 rpm .

Result: Viscosity of cream at 50rpm using spindle No 63 was found to be 2000cps.

FIGURE LXIV VISCOSITY (BROOKFIELD VISCOMETER)

9.10 Phase separation[43]:

Prepared cream was kept in a closed container at a temperature of 25-100 C away from light .

Then phase separation was checked for 24hr till 30 days .

Any change in the phase separation was observed / checked.

Result: No phase separation was observed.

9.11 Greasiness[43]:

Here the cream is applied on skin surface in form of smear and checked if the smear was oily or greasy.

Result: It is non greasy.

9.12 HPTLC of herbal extracts :

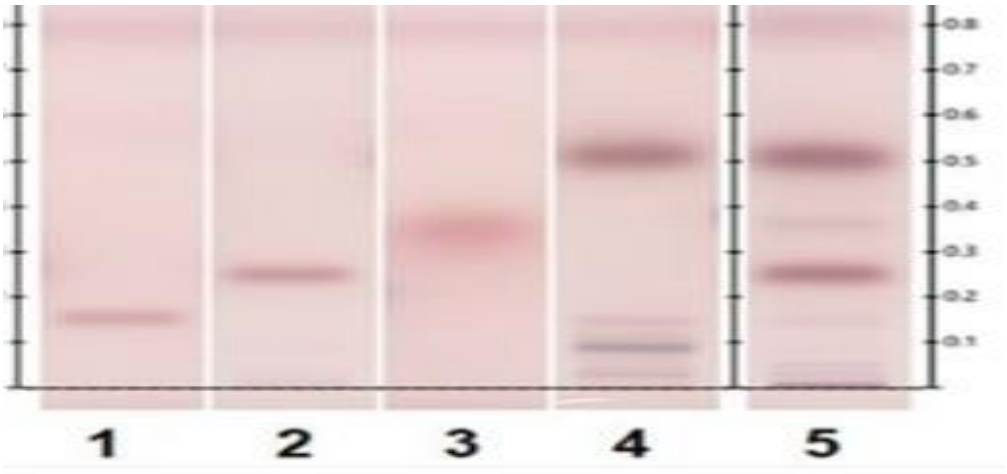


FIGURE LXV HPTLC ANALYSIS

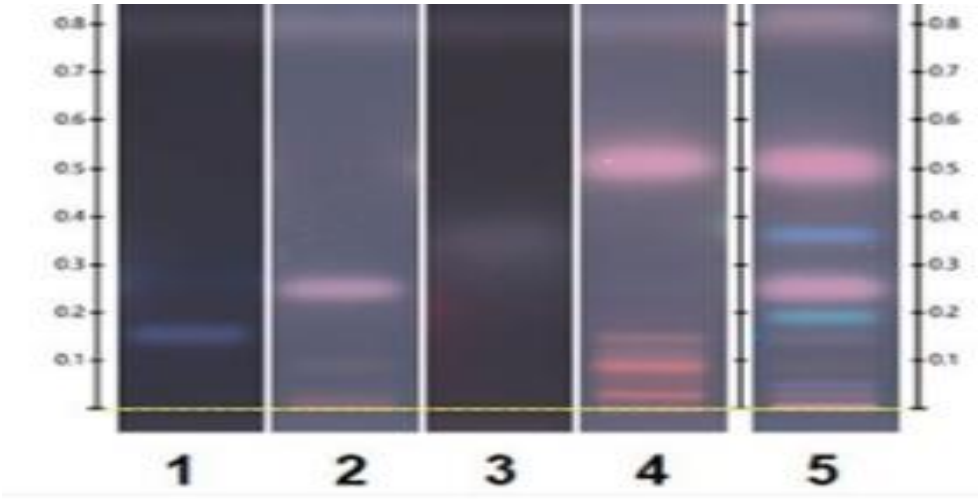


FIGURE LXVI HPTLC ANALYSIS

1. **Aloe Vera**
2. **Neem**
3. **Carrot seed**
4. **Ginseng**
5. **Ginkgo**

X. PRODUCT AND LABEL

FIGURE LXVII FORMULATED PRODUCT

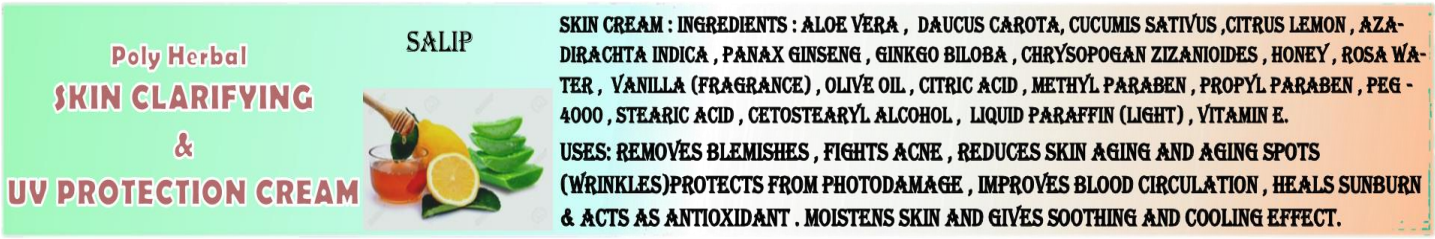


FIGURE LXVIII LABEL OF PRODUCT

XI. APPLICATIONS:

It is a skin clarifying cream which works for removing Blemishes (Anti-acne), reducing hyperpigmentation (depigmenting) , reduces fine lines (Anti-wrinkle , Anti-aging) and UV protection.

TABLE VIII APPLICATION AND MOA OF HERBAL API AND IT'S IMPACT ON SKIN

Ingredients	Impact on skin	Mechanism of action	Miscellaneous points
Aloe barbaris[44]	Depigmentation , anti-aging , anti-wrinkle , anti-acne , UV protection , Moisturizer.	Protective against radiation damage to skin by an antioxidant protein, metallothionein, is generated in the skin, which scavenges hydroxyl radicals and prevents suppression of superoxide dismutase and glutathione peroxidase in the skin. It reduces the production and release of skin keratinocyte-derived immunosuppressive cytokines such as interleukin-10 (IL-10) and hence prevents UV-	Source for Vit. A , B_{12} , C , E. Anti-inflammatory and cooling properties generally used for sunburn.

		induced suppression of delayed type hypersensitivity. Inhibits the cyclooxygenase pathway and reduces prostaglandin E2 production from arachidonic acid. Recently, the novel anti-inflammatory compound called C-glucosyl chromone was isolated from gel extracts. Mucopolysaccharides help in binding moisture into the skin. Aloe stimulates fibroblast which produces the collagen and elastin fibers making the skin more elastic and less wrinkled. It also has cohesive effects on the superficial flaking epidermal cells by sticking them together, which softens the skin. The amino acids also soften hardened skin cells and zinc acts as an astringent to tighten pores. Its moisturizing effects has also been studied in treatment of dry skin associated with occupational exposure where aloe vera gel gloves improved the skin integrity, decreases appearance of fine wrinkle and decreases erythema. It also has anti-acne effect.	
Citrus limon peel[45]	Depigmentation , anti-aging , anti-wrinkle , anti-acne , anti-oxidant.	**Antioxidant activity :** Augmentation of antioxidant cellular defences via ERK/Nrf2 signalling pathway. **Anti-inflammatory activity :** Inhibition of NF-kB factor , nitric oxide (iNOS) , induced cyclooxygenase (COX-2). Down regulation of TLR signaling pathway. -	Detoxifies skin. Anti-bacterial , anti-microbial. Skin lightening effect which helps to remove darkspots , scars and blemishes .
Honey[46][47]	Depigmentation , anti-aging , anti-wrinkle , humectant.	Honey is a natural antiseptic and anti-inflammatory that helps to heal breakouts of acne and prevent extra infections. Honey also reduces the redness and swelling of acne. It controls the accumulation of dust in the skin pores and absorbs the impurities from the pores. The sugar present in honey acts as a natural humectant, which means it draws moisture from the air into your skin. Raw honey hydrates your skin and leaves a soft, radiant, and shiny skin. It reduces the dryness of skin by providing long-lasting hydration.	Acts as humectant without making skin oily.

		Honey is rich in antioxidants that are good for your skin to nourish and hydrate it. When it comes in contact with water or the heat of your skin, it crystalizes. These tiny crystals act as a gentle scrub for your skin and help to remove dirt and dead skin. Honey moisturizes the top layers of your skin and helps to reduce wrinkles and fine lines. It soothes the dry, irritated, and wrinkled skin by providing nourishment to it. It also acts as an antioxidant, where it delays the process of aging and helps you to look younger and radiant. The antioxidants present in honey works wonderfully on the skin to reduce the scar and stretch marks. It nourishes the damaged skin and induces the scar healing process. It increases tissue regeneration and helps to revive the skin cells.	
Azadirachta indica leaf[48]	Depigmentation , humectant , anti-acne , anti-wrinkle	Neem plays role as free radical scavenging properties due to rich source of antioxidant. Azadirachtin and nimbolide showed concentration-dependent antiradical scavenging activity and reductive potential in the following order: nimbolide > azadirachtin > ascorbate . Neem also plays role as anti-inflammatory via regulation of proinflammatory enzyme activities including cyclooxygenase (COX), and lipoxygenase (LOX) enzyme.	Rich in anti-bacterial effect. Stimulates collagen production . Reduces scars.
Panax Ginseng root[49]-[54]	Depigmentation , anti-aging , anti-wrinkle , anti-acne.	Gensenosides Rb1, Rg1, Rg3, Re, Rd., Rh1, Rc, Rf, Rg5, Rg6, Rh3, Rk1, Ro, and Rz1 have been reported as anti-inflammatory responses due to negative regulation of pro-inflammatory cytokine expressions (TNF-α, IL-1β, and IL-6) and enzyme expressions in M1-polarized macrophages and microglia. Ginsenosides Re and Rp1 can suppress the NF-κB signaling pathway whereas ginsenosides Rc inhibits macrophage-derived cytokines. Clinical studies concluded a 38% higher more survival rate for patients who took ginseng as compared to patients who had not taken ginseng. Extract of *P. ginseng* berry calyx (Pg-C-EE) reported an anti-inflammatory mechanism through the expression of TNF-α, iNOS, COX-2 in lipopolysaccharide-activated macrophages and through NO production. Antifungal activities against *Epidermophyton floccosum, Trichophyton rubrum,*	Improves blood circulation . Rich in Vit. B_{12}, D. Brightens and revitalize complex.

		and *Trichophyton mentagrophytes*. The mechanism of antifungal activity was to find out which was due to interaction with the fungal cell membrane and damages the integrity of the membrane. The result concluded that notoginseng saponin can used for the treatment of ringworm.	
Daucus carota seed[55]	Depigmentation , anti-aging , anti-wrinkle , moisterizer	Works as a supporting and protective agent that not only enhances skin health but that also repairs damage on skin that has been exposed to pollution and environmental stress, which leads to symptoms of aging. Furthermore, it stimulates the growth of new tissue and new skin, thus promoting a clearer, brighter, evenly toned complexion. By contributing moisture, it relieves skin from irritation associated with ailments such as acne, boils, dermatitis, eczema, psoriasis, and sores, leaving skin looking and feeling smooth, firm, nurtured, revitalized, and generally healthy. Regular use of Carrot Seed Essential Oil on the dry and cracked skin can result in the softening of calluses, the faster healing of scars, the calming of irritation, and the fading of redness and unwanted marks such as age spots.	Anti-bacterial , anti-fungal , anti-inflammatory , anti-oxidant.
Chrysopogon zizanioides root[56]	Depigmentation , anti-aging , anti-acne , UV protection , Moisturizer , pH toner.	Vetiver oil has been claimed benefic in skin care, particularly for sensitive and older skin, due to its antiseptic, tonic and detoxifying properties. Declared useful to balance sebaceous gland activity, it hence helps normalize oily skin and clearing acne. It is also claimed to promote skin rejuvenation and to strengthen connective tissue, thus assisting with wound healing of mature, irritated and inflamed skins . Vetiver oil is also known to replenish moisture in dehydrated and dry skins and even to prevent stretch marks . Therefore, some authors report the use of vetiver oil in cosmetic formulas recommended for the treatment of skin' overproduction of sebum, resulting in acne flare-ups and weeping sores . Not toxic and nonirritant, vetiver oil also presents deodorizing properties.	Maintains skin pH. Evens skin tone . Tightens pore. Reduces oiliness. Reduces skin inflammation.

Cucumis sativus seed[57]-[61]	Depigmentation , anti-aging , anti-acne , UV protrction.	They have hydrating properties, which work to reduce dehydration and their high levels of vitamin K that help reduce cutaneous eruption such as puffiness (eye bags) and dark shadows. Cucumbers contain lignans that help to soothe down irritation and inflammation associated with sun burns. Used as a moisturizer and skin toner by inhibiting tyrosinase. Additionally, used to treat wrinkles and cleanse the skin. The deep cleansing action of cucumbers emanates from its naturally occurring organic acids such as glycolic, lactic and salicylic acids. Glycolic and lactic acids are alpha hydroxyl acids used as chemical exfoliants that promote the natural removal of dead cells and to keep the protective surface layers healthy by dissolving the glue-like substance in the epidermal layer. The glue-like substance causes a buildup of dead skin cell layer; leaving skin dehydrated, dull and coarse. Alpha hydroxy acids have been shown to increase the thickness of the epidermis as well as cause increased collagen density, improved elastic fiber quality, increased papillary dermal thickness and increased dermal acid mucopolysacharide translating into thicker, healthier skin with fewer rhytids . Alpha hydroxyl acids have been effective in the treatment of many skin conditions such as ache, psoriasis, bumps, pustules, eczema, dry skin, age spots, seborrheic keratosis, precancerous growths, hyperkeratosis, actinic keratosis and also black heads and whiteheads . Glycolic acid is the most active and beneficial of the alphahydroxyl acids in skin care, because of its ability to penetrate through the cell wall by virtue of its small molecular size . Once inside the cell, it triggers new formation of collagen and turns on the synthesis of dermal glycosaminoglycans to plump up the cell and the ground substance in the skin to reduce wrinkles on the skin's surface . Lactic acid improves the appearance of photodamage and surface pigmentation . Unlike glycolic and lactic acids, salicylic acid is a beta hydroxyl acid that exhibits a keratolytic, antiseptic and fungicidal properties . It can be used for the treatment of hyperkeratotic and scaling	Rich in Vit. E. Reduces stress and fatigue. Effective against pollution. Used during sunburn. Gives cooling effect.

		conditions such as dandruff, ichthyosis and psoriaisis . The fungicidal properties of salicylic acid may partly explain the topical use of cucumber preparation in the treatment of fungal skin infections such as tinea .	
Ginkgo Biloba leaf[62]-[64]	Depigmentation , anti-aging , anti-acne , potent antioxidant , humectant.	Ginkgo biloba leaf pretreatment caused decreases in cytotoxicity and the level of MMP-1, a key enzyme that degrades collagen in dermis, induced by H_2O_2 in HaCaT cells. Ginkgo biloba leaf caused increases in glutathione content and HO-1 level in cells, which appeared to be associated with the increase in Nrf2, a principal transcription factor for the antioxidant response. Ginkgo biloba leaf also increased keratinocyte migration, which might result from the increase in KLK-7, a key enzyme that degrades corneodesmosomes and thus stimulates desquamation of corneocytes in epidermis. Ginkgo biloba leaf increased the phosphorylation of c-Jun N-terminal protein kinase and extracellular signal-regulated kinase, which might contribute to the antioxidant and skin anti-aging effects of Ginkgo biloba leaf. It has skin anti-aging effects by protecting keratinocytes against excessive oxidative stress via stimulation of antioxidant response, reducing wrinkle formation via a decrease in MMP-1 expression, and stimulating desquamation via an increase in KLK-7 expression.	Anti-inflammatory. Fights free radical. Reduces roughness. Retains moisture on skin
Rosa damascene water [65]	Depigmentation , anti-aging , anti-wrinkle , anti-acne , skin hydration , Maintains skin pH , fragnance.	**May Help Balance Skin pH Levels**: Our skin has a pH between 4.1-5.8 . The pH of rose water is usually between 4.0-4.5. A study observed that skincare products with a pH between 4.0-5.0 could help minimize skin irritation and maintain the skin□™s natural pH levels . **Helps Ease Redness:** rose oil and rose water have an astringent effect on the blood capillaries close to the skin surface. Applying rose water helps ease redness caused by the enlarged capillaries. **May Hydrate Your Skin:** Rosewater feels refreshing on the skin and can help keep it hydrated. It is popularly used in toners to minimize the appearance of pores, as mists to refresh your makeup and soothe sunburns.	Reduces stress. Gives cooling effect. Brightens skin . Evens skin tone.

		Has Antimicrobial Effects: strong antibacterial effect against strains of *Aureus* (cause acne), *E. Coli*, *C. Violaceum*, and several other bacteria . It may also help minimize acne and keep your skin healthy. **Contains Antioxidants:** *Rosa damascena* has antioxidant properties. The extracts of this rose and the essential oil derived from it have free radical scavenging properties . This may reduce oxidative stress and help improve signs of aging to maintain youthful skin. **May Heal Wounds:** Rose oil has anti-inflammatory benefits and antimicrobial properties. **Has Anti-inflammatory Effects**: the anti-inflammatory and antioxidant effect of *Damascena* (mainly its extracts) could be attributed to vitamin C present in it .	
Tocopherol[66]	Depigmentation , anti-aging , anti-acne , Maintains skin pH , humectant.	**Moisturizing** effect by making a layer on skin. **Fighting UV-related skin damage** Vitamin E could fight skin damage from sun exposure. It is possible that adding vitamin E to sunscreen provides some additional skin benefits. **Wound healing** Vitamin E deficiencies can slow wound healing, a good amount of this nutrient could have the opposite effect. **Anti-inflammatory properties** Inflammation is the body's reaction to an injury or infection. It can cause pain, discoloration, and swelling. Many common skin conditions cause inflammation, including acne. That vitamin E supplements reduce inflammation in adults. **Does vitamin E help with scars?** Reduction in the appearance of scars with topical use of vitamin E.	Improves blood circulation.

Vanilla essential oil[67]	Fragnance , Anti-aging , anti- wrinkle , Anti-oxidant.	Vanilla is very rich in antioxidants which neutralise free radicals and reverse skin damage. It helps to slow down signs of ageing like fine lines, wrinkles, and age spots. It not only makes your skin rejuvenated but also smelling lovely. Acne flare-ups on the skin, using a vanilla extract infused anti-acne product will help with healing. Vanilla extract contains antibacterial and antioxidant properties that prevent breakouts and soothe redness and irritation. Vanilla extracts soothe the skin's irritations and inflammations. The application of vanilla extract helps in improving the texture of the skin to a great extent. The presence of B-vitamins like niacin, thiamin, B6, and pantothenic acid in vanilla play an important role in maintaining healthy skin. The antioxidants properties present in vanilla extract help to protect the skin from damage caused by environmental pollutants and toxins.	Neutralize free radical . Reverse skin damage. Reduces fine lines and age spots. Skin rejuvenation.

XII. DISCUSSION

There is a growing demand for herbal cosmetics in the world market and they are invaluable gift of nature. Therefore we formulated Poly herbal skin clarifying and UV protection cream in different concentrations. The polyherbal cream is an O/W type emulsion. Our study indicated that our formulation F1was found to be more stable, non greasy, smooth while remaining formulations were not stable they produced granules, separation of both the phases, increased greasiness. F1 formulation was found to be stable in ph, adequate viscosity, emollient, non greasy, easily spreadable, easily washable. Stable formulations were safe in respect to skin irritation and allergic sensitization. Extracts like Aloe extract, cucumber extract, neem extract, ginseng extract, ginkgo extract provides cooling properties, detoxifies skin, removes dark spots and blemishes, humectant, improves blood circulation, revitalizes and reduces skin inflammations. Antioxidants like Vit. A, B12, C, D, E in Lemon peel, aloevera extract, ginseng, tocopherol soothes and heals skin from sunburns.

XIII. CONCLUSION

From above discussion it is concluded that the prepared formulation showed good spreadability , no evidence of phase separation and good consistency during storage period and they are safe to be used on skin. It is concluded that it's possible to formulate creams with herbal extracts.

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