

Pharmacognostic Study of Some Crude Drugs Used for Preparation of Cold Cream

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ABSTRACT: this review article is based on pharmacognostic studies for formulation of cold cream. Now a days herbal products are very demanding in the market because of no side effects on the skin and less toxic for the body. Pharmacognostic studies are very important for the preparation of high quality and effective formulation of any product. For preparation of herbal formulations pharmacognostic studies like, morphology, microscopy and physic-chemical studies of crude drugs. These pharmacognostic studies helps in the identification of impurities and ensure the quality of crude drugs. Morphology includes the physical appearance like color, texture, odor etc. physic-chemical studies includes pH, ash value, flash point, smoke point, acid value, iodine value, peroxide value, etc. with help of the pharmacognostic studies we can formulate the high quality herbal products.

KEYWORDS: Physico-chemical studies, morphology, microscopy etc.

I. INTRODUCTION

Herbal preparations are the basis for finished herbal, products and may include comminute or powdered herbal materials, or extracts, tinctures and fatty oils of herbal materials. They are produced by extraction, fractionation, purification, concentration, or other physical or biological processes. They also include preparations made by steeping or heating herbal materials in alcoholic beverages and/or honey, or in other materials. Finished herbal products consist of herbal preparations made from one or more herbs. If more than one herb is used, the term "mixture herbal product" can also be used. Finished herbal products and mixture herbal products may contain excipients in addition to the active ingredients.^[1]

We are studying the formulation and evaluation of cold cream. Cold cream is the water

in oil. Cold cream gives the prolonged contact time in the site of application as compared to the other semi solid dosage form or formulation. The function of the cold cream is for restoring moisture to dry skin, it allows to eliminate the waste materials from the pores and also cools the body. It is easily watered washable and easy to wash away. They are non-irritating when applied on the skin.^[1]

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, reduce skin diseases like eczema, psoriasis, dry skin, wrinkles, rashes etc. and also adding glow to the face. We have used two herbal ingredients in our preparation which are Neem, Almond. Aloe Vera gel is used as a moisturizer, to reduce pimples and acne and also used for treatment of burn wounds. Neem is used as an antifungal and anti-inflammatory and it is also used to reduce scar, pigmentation, redness and itching of the skin. Cold cream is the water in oil emulsion. Cold cream gives the prolonged contact time in the site of application as compared to the other semisolid dosage form or formulation. They give elegance to the skin and it is not that much greasy. Due to the oil phase, it gives an emollience to the skin. The function of the cold cream is for restoring moisture to dry skin, it allows to eliminate the waste materials from the pores and also cools the body. It is easily watered washable and easy to wash away. They are non-conservation to the skin. It gets liquefy at body temperature natural pores.^[1]

Extraction Of Fixed Oil From Crude Drugs

Extraction of the essential oils industry has developed terminology to distinguish three types: water distillation; water and steam distillation; and direct steam distillation. Originally introduced by Von Rechenberg, these terms have become established in the essential oil industry. All three methods are subject to the same theoretical considerations which deal with distillation of two-phase systems. The differences lie mainly in the methods of handling the material. Some volatile oils cannot be distilled without decomposition and thus are usually obtained by expression (lemon oil, orange oil) or by other mechanical means. In certain countries, the general method for obtaining citrus oil involves puncturing the oil glands by rolling the fruit over a trough lined with sharp projections that are long enough to penetrate the epidermis and pierce the oil glands located within outer portion of the peel (ecuelle method). A pressing action on the fruit removes the oil from the glands, and a fine spray of water washes the oil from the mashed peel while the juice is extracted through a central tube that cores the fruit. The resulting oil-water emulsion is separated by centrifugation. A variation of this process is to remove the peel from the fruit before the oil is extracted. Often, the volatile oil content of fresh plant parts (flower petals) is so small that oil removal is not commercially feasible by the aforementioned methods. In such instances, an odorless, bland, fixed oil or fat is spread in a thin layer on glass plates. The flower petals are placed on the fat for a few hours; then repeatedly, the oil petals are removed, and a new layer of petals is introduced. After the fat has absorbed as much fragrance as possible, the oil may be removed by extraction with alcohol. This process, known as enfleurage, was formerly used extensively in the production of perfumes and pomades. In the perfume industry, most modern essential oil production is accomplished by extraction, using volatile solvents such as petroleum ether and hexane. The chief advantages of extraction over distillation is that uniform temperature (usually 50° C) can be maintained during the process. As a result, extracted oils have a more natural odor that is unmatched by distilled oils, which may have undergone chemical alteration by the high temperature. This feature is of considerable importance to the perfume industry; however, the established distillation method is of lower cost than the extraction process. Destructive distillation means distilling volatile oil in the absence of air.

When wood or resin of members of the Pinaceae or Cupressaceae is heated without air, decomposition takes place and a number of volatile compounds are driven off. The residual mass is charcoal. The condensed volatile matter usually separates into 2 layers: an aqueous layer containing wood naphtha (methyl alcohol) and pyroligneous acid (crude acetic), and a tarry liquid in the form of pine tar, juniper tar, or other tars, depending on the wood used. This dry distillation is usually conducted in retorts and, if the wood is chipped or coarsely ground and the heat is applied rapidly, the yield often represents about 10% of the wood weight used.^[2]

Hydro-distillation

In order to isolate essential oils by hydrodistillation, the aromatic plant material is packed in a still and a sufficient quantity of water is added and brought to a boil; alternatively, live steam is injected into the plant charge. Due to the influence of hot water and steam, the essential oil is freed from the oil glands in the plant tissue. The vapor mixture of water and oil is condensed by indirect cooling with water. From the condenser, distillate flows into a separator, where oil separates automatically from the distillate water.^[2]

Mechanism of Distillation

Hydro-distillation of plant material involves the following main physicochemical processes:

- i) Hydrodiffusion
- ii) Hydrolysis
- iii) Decomposition by heat

Hydro-diffusion

Diffusion of essential oils and hot water through plant membranes is known as hydrodiffusion. In steam distillation, the steam does not actually penetrate the dry cell membranes. Therefore, dry plant material can be exhausted with dry steam only when all the volatile oil has been freed from the oil-bearing cells by first thorough comminution of the plant material. But, when the plant material is soaked with water, exchange of vapors within the tissue is based on their permeability while in swollen condition. Membranes of plant cells are almost impermeable to volatile oils. Therefore, in the actual process, at the temperature of boiling water, a part of volatile oil dissolves in the water present within the glands, and this oil-water solution permeates, by osmosis, the swollen membranes and finally reaches the outer surface, where the oil is vaporized by passing

steam. Another aspect of hydrodiffusion is that the speed of oil vaporization is not influenced by the volatility of the oil components, but by their degree of solubility in water. Therefore, the high-boiling but more water-soluble constituents of oil in plant tissue distill before the lowboiling but less water-soluble constituents. Since hydrodiffusion rates are slow, distillation of uncomminuted material takes longer time than comminuted material.^[2]

Hydrolysis

Hydrolysis in the present context is defined as a chemical reaction between water and certain constituents of essential oils. Esters are constituents of essential oils and, in the presence of water, especially at high temperatures, they tend to react with water to form acids and alcohols. Therefore, if the amount of water is large, the amounts of alcohol and acid will also be large, resulting in a decreased yield of essential oil. Furthermore, since this is a time-dependent reaction, the extent to which hydrolysis proceeds depends on the time of contact between oil and water. This is one of the disadvantages of water distillation.^[2]

Effect of Heat

Almost all constituents of essential oils are unstable at high temperature. To obtain the best quality oil, distillation must be done at low temperatures. The temperature in steam distillation is determined entirely by the operating pressure, whereas in water distillation and in water and steam distillation the operating pressure is usually atmospheric. All the previously described three effects, i.e. hydrodiffusion, hydrolysis and thermal decomposition, occur simultaneously and affect one another. The rate of diffusion usually increases with temperatures as does the solubility of essential oils in water. The same is true for the rate and extent of hydrolysis. However, it is possible to obtain better yield and quality of oils by: (1) maintaining the temperature as low as possible, (2) using as little water as possible, in the case of steam distillation, and (3) thoroughly comminuting the plant material and packing it uniformly before distillation.^[2]

Three Types of Hydro-distillation

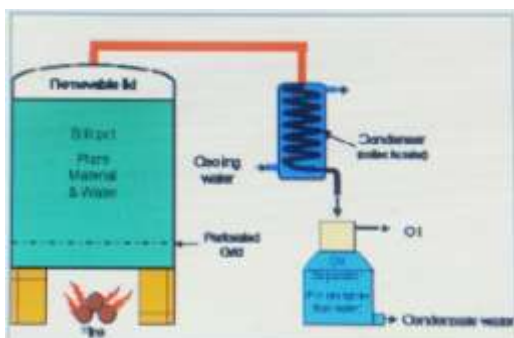
There are three types of hydrodistillation for isolating essential oils from plant materials:

1. Water distillation
2. Water and steam distillation
3. Direct steam distillation

Water Distillation

In this method, the material is completely immersed in water, which is boiled by applying heat by direct fire, steam jacket, closed steam jacket, closed steam coil or open steam coil. The main characteristic of this process is that there is direct contact between boiling water and plant material. When the still is heated by direct fire, adequate precautions are necessary to prevent the charge from overheating. When a steam jacket or closed steam coil is used, there is less danger of overheating; with open steam coils this danger is avoided. But with open steam, care must be taken to prevent accumulation of condensed water within the still. Therefore, the still should be well insulated. The plant material in the still must be agitated as the water boils, otherwise agglomerations of dense material will settle on the bottom and become thermally degraded. Certain plant materials like cinnamon bark, which are rich in mucilage, must be powdered so that the charge can readily disperse in the water; as the temperature of the water increases, the mucilage will be leached from the ground cinnamon. This greatly increases the viscosity of the water-charge mixture, thereby allowing it to char. Consequently, before any field distillation is done, a small-scale water distillation in glassware should be performed to observe whether any changes take place during the distillation process. From this laboratory trial, the yield of oil from a known weight of the plant material can be determined. The laboratory apparatus recommended for trial distillations is the Clevenger system. During water distillation, all parts of the plant charge must be kept in motion by boiling water; this is possible when the distillation material is charged loosely and remains loose in the boiling water. For this reason only, water distillation possesses one distinct advantage, i.e. that it permits processing of finely powdered material or plant parts that, by contact with live steam, would otherwise form lumps through which the steam cannot penetrate. Other practical advantages of water distillation are that the stills are inexpensive, easy to construct and suitable for field operation. These are still widely used with portable equipment in many countries. The main disadvantage of water distillation is that complete extraction is not possible. Besides, certain esters are partly hydrolyzed and sensitive substances like aldehydes tend to polymerize. Water distillation requires a greater number of stills, more space and more fuel. It demands considerable experience and

familiarity with the method. The high-boiling and somewhat water-soluble oil constituents cannot be completely vaporized or they require large quantities of steam. Thus, the process becomes uneconomical. For these reasons, water distillation is used only in cases in which the plant material by its very nature cannot be processed by water and steam distillation or by direct steam distillation.^[2]



Essential Oil Extraction by Expression

Expression or cold pressing, as it is also known, is only used in the production of citrus oils. The term expression refers to any physical process in which the essential oil glands in the peel are crushed or broken to release the oil. One method that was practiced many years ago, particularly in Sicily (spugna method), commenced with halving the citrus fruit followed by pulp removal with the aid of sharpened spoon-knife (known as a rastrello). The oil was removed from the peel either by pressing the peel against a hard object of baked clay (concolina) which was placed under a large natural sponge or by bending the peel into the sponge. The oil emulsion absorbed by the sponge was removed by squeezing it into the concolina or some other container. It is reported that oil produced this way contains more of the fruit odor character than oil produced by any other method. A second method known as equaling (or the scodella method), uses a shallow bowl of copper (or sometimes brass) with a hollow central tube; the equaling tool is similar in shape to a shallow funnel. The bowl is equipped with brass points with blunt ends across which the whole citrus fruit is rolled by hand with some pressure until all of the oil glands have burst. The oil and aqueous cell contents are allowed to dribble down the hollow tube into a container from which the oil is separated by decantation. Obviously, hand pressing is impractical because it is an extremely slow process, e.g. on average only 2-4 lbs oil per day can be produced by a single person using one of these hand methods. As a result, over the years a number

of machines have been designed to either crush the peel of a citrus fruit or crush the whole fruit and then separate the oil from the juice^[2].

Pelatrice Process

In the pelatrice process, citrus fruits are fed from a hopper into the abrasive shell of the machine. The fruits are rotated against the abrasive shell by a slow-moving Archimedian screw whose surface rasps the fruit surfaces causing some of the essential oil cavities on the peel to burst and release their oil-water emulsion. This screw further transports the fruit into a hopper in which rollers covered with abrasive spikes burst the remaining oil cavities. The oil and water emulsion is washed away from the fruit by a fine spray of water. The emulsion next passes through a separator where any solids are removed, after which it passes through two centrifugal separators working in series to yield the pure oil. Most bergamot oil and some lemon oil are produced this way in Italy.^[2]



“Pelatrice” for the extraction of citrus essential oil

Sfumatrice Process

The sfumatrice equipment consists of a metallic chain that is drawn by two horizontal ribbed rollers. The peels are conveyed through these rollers during which time they are pressed and bent to release their oil. As in pelatrice, the oil is washed away from the sfumatrice rollers by fine sprays of water. Again, the oil is initially passed through a separator prior to being sent to two centrifuges in series, so that purified oil can be produced. At one time, sfumatrice was the most popular process for citrus oil isolation in Italy; however, today the pelatrice method appears more popular.^[2]



Essential Oil Extraction with Cold Fat (Enfleurage)

Despite the introduction of the modern process of extraction with volatile solvents, the old fashioned method of enfleurage, as passed on from father to son and perfected in the course of generations, still plays an important role. Enfleurage on a large scale is today carried out only in the Grasse region of France, with the possible exception of isolated instances in India where the process has remained primitive. The principles of enfleurage are simple. Certain flowers (e.g. tuberose and jasmine) continue the physiological activities of developing and giving off perfume even after picking. Every jasmine and tuberose flower resembles, so to speak, a tiny factory continually emitting minute quantities of perfume. Fat possesses a high power of absorption and, when brought in contact with fragrant flowers, readily absorbs the perfume emitted. This principle, methodically applied on a large scale, constitutes enfleurage. During the entire period of harvest, which lasts for eight to ten weeks, batches of freshly picked flowers are strewn over the surface of a specially prepared fat base (corps), let there (for 24 h in the case of jasmine and longer in the case of tuberose), and then replaced by fresh flowers. At the end of the harvest, the fat, which is not renewed during the process, is saturated with flower oil. Thereafter, the oil is extracted from the fat with alcohol and then isolated. The success of enfleurage depends to a great extent upon the quality of the fat base employed. Utmost care must be exercised when preparing the corps. It must be practically odorless and of proper consistency. If the corps is too hard, the blossoms will not have sufficient contact with the fat, curtailing its power of absorption and resulting in a subnormal yield of flower oil. On the other, if it is too soft, it will tend to engulf the flowers and the exhausted ones will adhere; when removed, the flowers will retain adhering fat, resulting in considerable shrinkage

and loss of corps. The consistency of the corps must, therefore, be such that it offers a semi hard surface from which the exhausted flowers can easily be removed. The process of enfleurage is carried out in cool cellars, and every manufacturer must prepare the corps according to the prevailing temperature in the cellars during the months of the flower harvest. Many years of experience have proved that a mixture of one part of highly purified tallow and two parts of lard is eminently suitable for enfleurage. This mixture assures a suitable consistency of the corps in conjunction with high power of absorption. The fat corps thus prepared is white, smooth, absolutely of uniform consistency, free of water and practically odorless. Some manufacturers also add small quantities of orange flower or rose water when preparing the corps. This seems to be done for the sake of convention. Such additions somewhat shade the odor of the finished product by imparting a slight orange blossom or rose note.^[2]

Enfleurage and Defleurage

Every enfleurage building is equipped with thousands of so-called chassis, which serve as vehicles for holding the fat corps during the process. A chassis consists of a rectangular wooden frame. The frame holds a glass plate upon both sides of which the fat corps is applied with a spatula at the beginning of the enfleurage process. When piled one above the other, the chassis form airtight compartments, with a layer of fat on the upper and lower side of each glass plate. Every morning during the harvest the freshly picked flowers arrive, and after being cleaned of impurities, such as leaves and stalks, are strewn by hand on top of the fat layer of each glass plate. Blossoms wet from dew or rain must never be employed, as any trace of moisture will turn the corps rancid. The chassis are then piled up and left in the cellars for 24 h or longer, depending upon the type of flowers. The latter rest in direct contact with one fat layer (the lower one), which acts as a direct solvent whereas the other fat layer (beneath the glass plate of the chassis above) absorbs only the volatile perfume given off by the flowers.



Enfleurage

After 24 h, the flowers have emitted most of their oil and start to wither, developing an objectionable odor. They must then be removed from the corps, which process, despite all efforts to introduce labor-saving devices, is still done by hand. Careful removal of the flower (defleurage) is almost more important than charging the corps on the chassis with fresh flowers (enfleurage) and, therefore, the persons doing this work must be experienced and skilled. Most of the exhausted flowers will fall from the fat layer on the chassis glass plate when the chassis is struck lightly against the working table, but since it is necessary to remove every single flower and every particle of the flower, tweezers are used for this delicate operation. Immediately following defleurage, that is, every 24 h, the chassis are recharged with fresh flowers. For this purpose the chassis are turned over and the fat layer, which in the previous operation formed the top (ceiling) of the small chamber, is now directly charged with flowers. In the case of jasmine, the entire enfleurage process lasts about 70 days: daily the exhausted flowers are removed and the chassis are recharged with fresh ones. At the beginning of, and several times during, the harvest, the fat on the chassis is scratched over with metal combs and tiny furrows are drawn in order change and increase the surface of absorption. At the end of the harvest, the fat is relatively saturated with flower oil and possesses the typical fragrance. The perfumed fat must then be removed from the glass plates between the chassis. For this purpose, it is scraped off with a spatula and then carefully melted and bulked in closed containers. The final product is called pomade (pomade de jasmine, pomade de tuberous, pomade de violet, etc.). The most highly saturated pomade is pomade no. 36, because the corps on the chassis have been treated with fresh flowers 36 times during the whole process of enfleurage. At

the beginning of the harvest, every chassis is charged with about 360 g fat corps on each side of the glass plate, in other words, with 720 g per chassis. Every kilogram of fat corps should be in contact with about 2.5 kg (preferably with 3.0 kg) of jasmine flowers for the entire period of enfleurage, which lasts from 8 to 10 weeks. The quantities differ somewhat for different flowers. At the end of enfleurage, the fat corps has lost about 10% of its weight because of the various manipulations.^[2]

Hot Maceration Process

In this process, the long enfleurage time is reduced by the immersion of petals in molten fat heated at 45°-60° C for 1 to 2 h, depending upon the plant species. After each immersion, the fat is filtered and separated from the petals. After 10 to 20 immersions, the fat is separated from waste flowers and water. Absolute of maceration is then produced from fat containing oil through the process of extraction and concentration under reduced pressure. It is mainly used for highly delicate flowers whose physiological activities are lost rapidly after their harvest, such as lily of valley.^[2]

Modern (Non-traditional) Methods of Extraction of Essential Oils

Traditional methods of extraction of essential oils have been discussed and these are the methods most widely used on commercial scale. However, with technological advancement, new techniques have been developed which may not necessarily be widely used for commercial production of essential oils but are considered valuable in certain situations, such as the production of costly essential oils in a natural state without any alteration of their thermosensitive components or the extraction of essential oils for micro-analysis. These techniques are as follows:

- Headspace trapping techniques
 - Static headspace technique
 - Vacuum headspace technique
 - Dynamic headspace technique
- Solid phase micro-extraction (SPME)
- Supercritical fluid extraction (SFE)
- Phytosol (phytol) extraction
- Protoplast technique
- Simultaneous distillation extraction (SDE)
- Microwave distillation
- Controlled instantaneous decomposition (CID)
- Thermomicrodistillation
- Microdistillation

- Molecular spinning band distillation
- Membrane extraction Some of these techniques are discussed in other chapters. Here, a few important, relevant references are provided.^[2]

INGREDIENTS OF FORMULATION

The details of the plant material used for the formulation of cold cream are mentioned below

- Almond oil
- Neem oil
- Borax
- Beeswax
- Rose water

ALMOND OIL

Biogicalsource : Almond oil is a fixed oil obtained by expression from the seeds of *Prunus amygdalus* (Rosaceae) var. *dulcis* (sweet almonds) or *P. amygdalus* var. *amara* (bitter almonds)

Geographical location :

The oil is mainly produced from almonds grown in the countries bordering the Mediterranean (Italy, France, Syria, Spain, and North Africa) and Iran.

Charectersics :

Almond trees are about 5 m in height. The young fruits have a soft, felt-like pericarp, the inner part of which gradually becomes sclerenchymatous as the fruit ripens to form a pitted endocarp or shell. The shells, consisting mainly of sclerenchymatous cells, are sometimes ground and used to adulterate powdered drugs. The sweet almond is 2–3 cm in length, rounded at one end, and pointed at the other. The bitter almond is 1.5–2 cm in length but of similar breadth to the sweet almond. Both varieties have a thin, cinnamon-brown testa which is easily removed after soaking in warm water. The oily kernel consists of two large, oily planoconvex cotyledons, and a small plumule and radicle, the latter lying at the pointed end of the seed. Some almonds have cotyledons of unequal sizes and are irregularly folded. Bitter almonds are found in samples of sweet almonds; their presence of oil.

Chemical Constituents :

Both varieties of almond contain 40–55% of fixed oil, about 20% of proteins, mucilage and emulsin. The bitter almonds contain in addition 2.5–4.0% of the colourless, crystalline, cyanogenic glycoside amygdalin.○

Almond oil is obtained by grinding the seeds and express-ing, them in canvas bags between slightly heated iron plates. The oil is clarified by subsidence and filtration. It is a pale yellow liquid with a slight odour and bland nutty taste. It contains olein, with smaller quantities of the glycosides of linoleic and other acids.

Use: Expressed almond oil is an emollient and an ingredient in cosmetics. Almond oil is used as a laxative, emollient, in the preparation of toilet articles and as a vehicle for oily injections.^[3]

Neem Oil

Neem oil contains Azadirachtin which is extracted rom the neem oil. Neem oil is naturally occurring pesticide found in seeds from the neem tree.^[3]

Use:

Used as antiseptic

Borex

its mild and antiseptic nature, quite a few natural cosmetic products tend to include Borax as an essential ingredient as well. In cosmetic products, borax is sometimes used as an emulsifier, buffering agent, or preservative for moisturizing products, creams, shampoos, gels, lotions, bath bombs, scrubs, and bath salts.^[3]

Bee wax

It can protect skin from environmental irritants and extreme weather. Promotion of Hair Growth-Beeswax not only moisturizes and soothes hair, but it can keep moisture from getting out of the hair. Beeswax can create a protective layer on the skin. It's also a humectant, which means that it attracts water. It can help you fight conditions like acne, dry skin, eczema, and stretch marks. Our raw beeswax can help you create your own skin care moisturizers and lotions specially formulated just for you.^[3]

Rose water

Rose Water Maintains the Skin's Natural pH Balance. Chemically produced soaps and cleansers disrupt the pH balance of our skin, making it prone to bacteria that cause various skin conditions like rashes and acne. This property helps rose water restore the skin to its normal pH level.

Use:

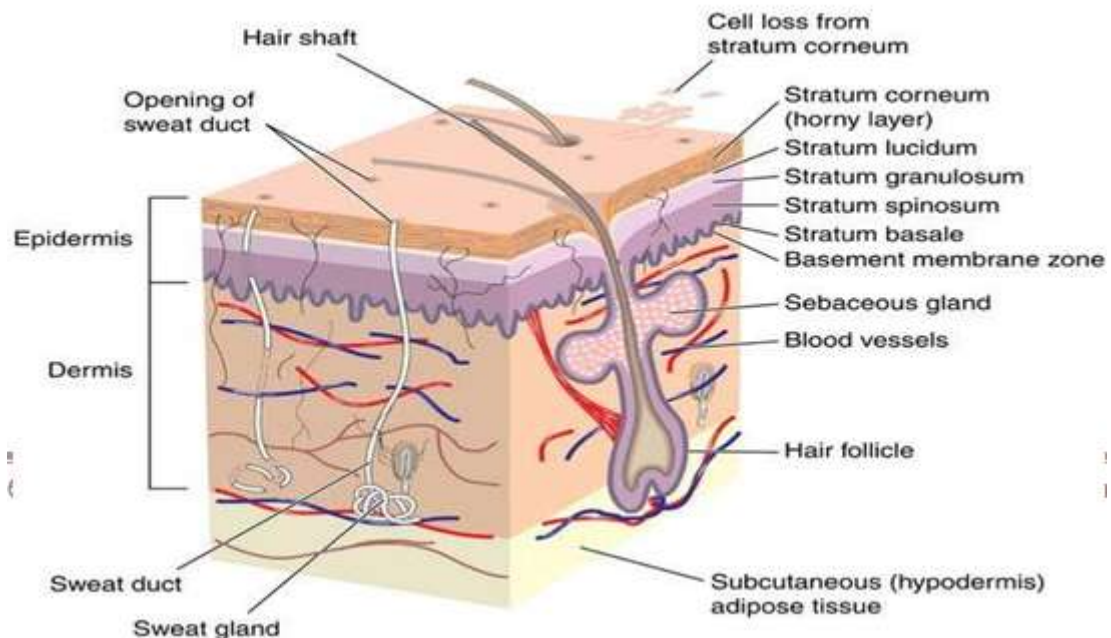
Used as moisturizing agent and provides characteristic odor to Formulaton.^[3]

Structure of skin

The skin (cutis, integument) and its derivatives comprise the integumentary system.

The skin is broadly segregated into three basic layers such as:

1. Epidermis: Superficial, thinner portion of epithelial tissues.
2. Dermis: Deeper, thicker connective tissue.
3. Hypodermis: Deep to the dermis, but not exactly the part of skin, is the subcutaneous layer comprising areolar and adipose tissue. Skin appendages include eccrine sweat glands, apocrine glands, sebaceous glands, and Hair.^[5]

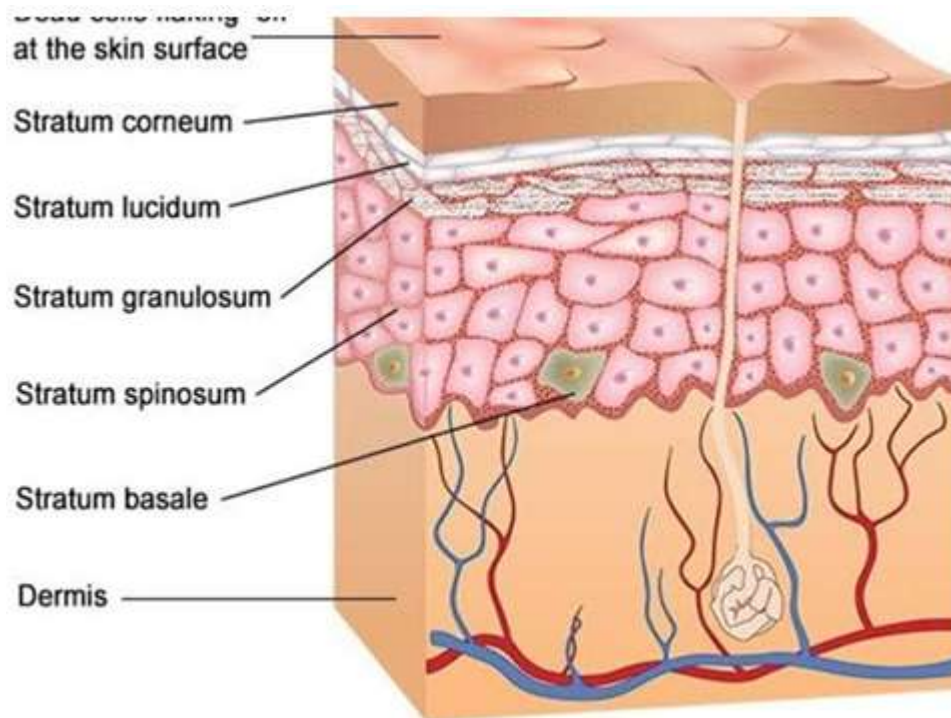


1. Epidermis:

It is the uppermost multi-layer of the skin, composed of stratified keratinised squamous epithelium. It contains four principal types of cells, such as keratinocytes (90%), melanocytes, Langerhans cells and Merkel cells. The thickness of epidermis varies depending on the cell size and the number of cell layers ranging from to honey about 0.8 mm on the palms and soles down to 0.6 mm on the eyelids. The epidermis is divided into 5

sub-layers namely:

- (a) Stratum Corneum (horny layer)
 - (b) Stratum lucidum
 - (c) Stratum granulosum (granular layer)
 - (d) Stratum spinosum (prickly cell layer)
 - (e) Stratum germinativum (basal layer and dermoepidermaljunction)
- (a) Stratum Corneum (Corny = horny): It is the most differentiated top



superficial layer of keratinised cells (corneocytes). It consists of 25-30 layers of flattened keratinocytes that contains mostly keratin (tough fibrous protein) The nuclei are absent. Between the cells are lipids from lamellar granules that form major constituent of the water barrier of the skin. These multiple layers act as protective for the deeper layer from injury and microbial abrasion. The thickness of the skin varies over the surface of the body ranges from 1 mm to 5 mm, which differs mainly in palms and soles of feet.

(b) Stratum lucidum; It lies immediately below stratum corneum and is considered as a subdivision of stratum corneum. It is thin, transparent, glistening layer. It is present only in the thick skin of fingertips, palms, and soles.

This is a highly retractile layer; poorly stained hyaline zone contains eosinophilic cells in the process of keratinization is well advanced.

(c) Stratum granulosum (granules = little grain): It is the middle and superficial layer of the non-keratinized portion of the epidermis. These are 1-3 cells thick spindle shaped cells enriched with intensely staining keratohyaline granules which contain cystine-rich and histidine protein. This keratogenous or transitional zone is a region of intense biochemical activity and morphological changes.

(d) Stratum spinosum (spinos = thorn like): This is the broad layer, where 8-10 layers of many-sided

keratinocytes fit closely together. The cells flatten and their nuclei shrink, and look like polygon, thus also called as polygonal cells, prickle cells as they are interconnected by fine prickles which helps in providing strength and flexibility to the skin. Projections of both Langerhans cells and melanocytes also appear in this layer.

(e) Stratum Germinativum or Stratum Basale (Basal = base): It is the deepest layer of epidermis where basal cells are non-nucleated, columnar and about 6 μm wide with their long axis at right angles to the dermoepidermal junction. It is also called as stratum germinativum due to mitotic active cells which constantly proliferating the skin and renew the epidermis providing constant thickness and healthy balanced skin. This layer contains melanocytes which are responsible for production and distribution of melanin granules to the keratinocytes required for pigmentation, a protective measure against radiations.^[4]

2. Dermis:

Dermis is the second deeper region lying in between the epidermis and subcutaneous fatty region. It is formed from connective tissues containing collagen and elastin fibre including few cells as fibroblasts, macrophages, and adipocytes. Blood vessels, nerve glands and hair follicles are embedded in dermal tissues. The superficial portion of dermis called papillary layer which consists of

areolar connective tissues containing fine elastin fibres. The surface area is greatly increased by small finger like projection called dermal papillae which contains papillary loops project into the epidermis. These dermal papillae contain tactile receptors called corpuscles of touch or Meissner corpuscles, nerve endings that are sensitive to touch.

The reticular region, attached to the subcutaneous layer consists of dense irregular connective tissues containing fibroblast, bundles of collagen and some coarse elastic fibres. These collagen and elastin fibres provide strength, extensibility, and elasticity to the skin. The extensibility can be seen during pregnancy and obesity which sometimes leave striae (Stretch marks) on the skin surface.^[4]

3. Hypodermis (Hypo below):

It is a subcutaneous layer which lies deep to the dermis, but not the part of skin. This layer consists of areolar and adipose tissues known as superficial fascia attaching the dermis to the underlying structures. This region also contains nerve endings called lamellate (pacinian) corpuscles that are sensitive to pressure. It serves as the storage depot for fat and contains large blood vessels that supply the skin.^[4]

4. Skin Appendages: These are also known as skin derivatives which include hair follicles, associated sebaceous glands (pilosebaceous glands), sweat glands (eccrine and apocrine glands) and nails.

(i) Hair follicle: It is the product of synthesized protein following cell division at the root of hair pressure. The number of hairs per unit area varies at different parts of the body.

(ii) Sebaceous glands: These are responsible for sebum secretion and constitute fatty layer over the skin and hair. These are present on face, shoulders, upper chest and scalp but not palms and soles. The abundance of sebaceous glands is 500-1000 per square centimetre.

(iii) Eccrine sweat glands: These are salty sweat glands distributed over the surface of the body to regulate the body temperature by secreting dilute aqueous solution of salt and some other minor components called salt. These glands are simple coiled tubes with density from 100-200 glands per centimetre square of the body surface depending on the region

(iv) Apocrine glands: These are present only on the selected region of the body such as axillae (armpits) in anogenital region and around the nipples. Due to emotional stress and sexual

stimulation, they secrete milky substance containing protein, lipoprotein, lipids, and diverse proteins. These are ten folds larger than the eccrine sweat gland.

(v) Nails: Nails are plates of tightly packed, hard, dead, keratinized epidermal cells that form a clear, solid covering over dorsal surface of distal portion of digits.^[4]

Functions of skin:

The skin performs a multitude of functions listed below:

1. It forms the protective waterproof layer which acts as barrier against injury and microbial invasion, chemical agents, and various environmental agents.
2. It contributes to thermoregulation by liberating sweat, on the surface and by adjusting the flow of blood in the dermis
3. It also serves as blood reservoir where dermis houses and extensive network of blood vessels that carry 8-10 % of total blood in a resting adult.
4. It serves as the medium of sensation, including tactile sensation touch, pressure, vibration and tickling as well as thermal sensation such as warmth and coolness and the sensation of pain.
5. It excretes sodium chloride and metabolites like urea.
6. It also helps in maintaining water and electrolyte balance.
7. It helps in synthesis of vitamin D from ergosterol of skin by the action of UV rays of sunlight.
8. It synthesizes melanin from tyrosine.
9. It secretes sweat and sebum which keep the skin soft.
10. It stores fat, water, chlorides, and sugar.^[4]

II. MATERIAL AND METHODS

Morphological Parameters Of Crude Drugs/ Oil :

Almond Oil:

Its an clear Yellow, Viscous liquid of characteristics mild odor and taste^[3].

Neem Oil:

Apex :- Ovate – Lanceolate

Base :- Unequal

Colour :- Smooth and dark green

Odour :- Typical

Taste :- Bitter^[3]

Borex:

Borex is a White Crystalline solid.^[3]

Beeswax:

It is a food grade wax with a white color when it is freshly prepared.^[3]

Rose Water:

It is obtained by distillation process of fresh rose petals. It should be clear and colourless, not mucilaginous and free from metallic impurities.^[3]

Microscopic Properties of Crude drugs:

Almond :

The edible almond seed has a brown testa enclosing the two white cotyledons. The testa has an outer epidermis which consists of relatively large thin-walled cells which range from 100 to 300 μ m in width. The major portion of the testa consists of approximately 14–20 layers of flattened parenchymal cells with the total thickness of the layers ranging from 80 to 120 μ m. The testa also contains occasional vascular bundles which have spiraled secondary wall thickenings in the protoxylem cells. Examination of the outer surface of the cotyledon beneath the testa reveals cells that are irregular in outline and about 15–20 μ m in width. When viewed in cross section, the epidermis of the cotyledon consists of a single layer of cells, which is subtended by the parenchymal cells of the cotyledon. The flat inner surface of each cotyledon also consists of cells that are irregular in shape and likewise are about 15–20 μ m in width. Each cotyledon contains a relatively small amount of provascular tissue that extends throughout the parenchymal tissue. The provascular tissue is characterised by narrow cells approximately 5 μ m thick and 20–40 μ m long arranged in bundles. Each cotyledon consists primarily of thin-walled (1–3 μ m in thickness) parenchymal cells which range from 15 to 40 μ m in width. The parenchymal cells possess a cytoplasmic network, which surrounds the angular protein bodies which range from 2 to 12 μ m in diameter and the spaces once occupied by lipid bodies which can be up to 3 μ m in width. The protein bodies contain calcium oxalate crystals, globoid crystals, and numerous spaces once occupied by protein crystalloids. The thin cytoplasmic network that surrounds the spaces once occupied by lipid bodies demonstrates a limited amount of cytoplasm in mature almond parenchymal cells.^[3]

Physical Properties for determination of oils:

Refractive Index

The refractive index was determined with refractometer. The prism of the refractometer was

wiped with tissue paper moistened with acetone to remove dirt, oil or grease. A drop of the oil sample was placed on the surface and clamped. The lens was viewed and the control knob adjusted until a faint blue line was seen in form of a cross across the meter. The reading was then taken and recorded.^[5]

Specific Gravity

This is the ratio of the mass of oil in gram weight to that of equal volume of water. A 50 ml pycnometer bottle was washed, then dried and weighed (W1). The bottle was filled with water and weighed (W2). The bottle was emptied and dried. Then, the bottle was filled with the oil sample and was weighed (W3). It was calculated using equation:^[5]

$$\text{Specific Gravity} = \frac{W_3 - W_1}{W_2 - W_1}$$

W3 is the Weight of Oil

W2 is the Weight of volume of water

W1 is the Weight of empty bottle

Kinematic Viscosity

A clean and dry viscometer with a flow time above 200 seconds was selected for the oil sample. The viscometer was charged with the sample by inverting the tube's thinner arm into the liquid sample and suction force was drawn up to the time mark of the viscometer, after which the instrument was turned to its normal vertical position. The viscometer was placed into holder and inserted to a constant temperature water bath set at 40°C. The suction force was then applied to the thinner arm to draw the sample slightly above the upper timing mark. The efflux time was recorded by timing the flow of the sample as it flowed freely from the upper timing mark to the timing mark to the lower timing mark. This was obtained using equation:^[5]

$$\text{Viscosity} = \frac{\text{Flow time} \times \text{Specific gravity} \times 1.002}{\text{Flow time of water}}$$

Smoke Point

A petri dish was filled with 20 ml of the sample oil and this was heated continuously on a hot plate until the sample gave off a thin fume with continuous streams of bluish flame. A thermometer was clamped on the retort-stand, the sensitive part of thermometer was dipped into the petri dish to record the temperature at this point.^[5]

Flash Point

The same oil sample was used and with the aid of a clamp holder, a thermometer was hung and dipped inside the oil, ensuring that the thermometer does not touch the bottom of the petri dish which was placed on a hot plate. The sample was heated until a sufficient vapour is produced when flame was applied, it causes burning for more than one minute. The temperature is then recorded.^[5]

Fire Point

The sample that was used for the flash point was used with the heating continued until a sufficient vapour was produced and when the flame was applied, it caused burning for a period of more than one minute. The temperature was then recorded.^[5]

Cloud Point

50 ml of sample was measured into a glass bottle containing a thermometer and immersed together in a water bath. The water bath and the content were cooled in a refrigerator with the stirring of the oil. The temperature at which the thermometer was no longer visible was taken as the cloud point.^[5]

Pour Point

5 ml of oil was drawn into a capillary tube tied to a thermometer, placed in a 250 ml beaker containing distilled water immersed together in a water bath for controlled heating. The temperature at which the oil just begins to move downward due to its weight is called the pour point.^[5]

Oil Yield

The powdered seeds before oil extraction were weighed and also the powdered seeds after oil extraction. The percentage oil yield was obtained using equation:^[5]

$$\% \text{ Oil Yield} = \frac{\text{Initial weight of Sample} - \text{Final weight of Sample}}{\text{Initial weight of Sample}} \times 100\%$$

Chemical Parameters Of Almond Oil

Acid Value

Three grams of each cooled oil sample was weighed in 250 mL of conical flasks and 30 mL of freshly neutralized ethyl alcohol (ethanol) was added to the samples and then shaken well to dissolve sample. The sample solution was boiled for about five minutes and cooled and then 1 mL of phenolphthalein indicator was added to the sample

solution. The sample solution was treated with 1 N sodium hydroxide solution until permanent pink light color appeared. The acid value was estimated using the following equation:

$$\text{Acid value} = \frac{2.82 \times V \times 100}{W \times 1000 \times 4}$$

where W is weight of oil that equals 3 grams, V is titre value of 1 N NaOH, and 2.82 is equivalent weight of oleic acid.^[5]

Saponification Value

Two grams of each oil sample was weighed in 250 mL Erlenmeyer flasks; then 25 mL of alcoholic potassium hydroxide solution was added into the flasks. The blank determination was conducted along with the sample. The samples flask and the blank flask were connected with air condensers and boiled gently in the water bath, steadily until the saponification was completed, indicated by absence of oily matter and the appearance of clear solution. Clarity was achieved in half hour boiling. After the flask and the condenser cooled, inside of the condensers was washed down with about 10 mL of ethanol and then 1 mL of phenolphthalein indicators was added to the solution. Excess potassium hydroxide was titrated with 0.5 N hydrochloric acid until cloudy solution was formed. The saponification value was estimated using the following equation:

$$\text{Saponification value} = \frac{56.1 \times (b - a) \times N}{W}$$

Where W is weight of sample that equals 2 grams, b is blank titre value, a is sample titre value, and N is 0.5 normality of HCl.^[5]

Iodine Value

Five grams of oil samples was weighed in 250 mL conical flasks and then 25 mL of carbon tetra chloride was added to each oil sample and content was mixed well. 25 mL of Hanus reagent was added to the solution, swirled for proper mixing, and kept in the flask in dark for half an hour. After standing, 15 mL of potassium iodide solution was added and then 100 mL of distilled water was added into the mixture and 1 mL starch indicator solution was added to the sample solution. Then, liberated iodine was titrated with 0.01 N of sodium thiosulphate solution; then, at the

end, blue color was formed and then disappeared after thorough shaking. The blank determination was carried in the same manner as test sample but without oil. The iodine value was estimated using the following formula:

$$\text{Iodine value} = \frac{(b - a) \times N \times 1.269 \times 100}{W}$$

Where b is blank titre value, a is sample titre value, is N normality of thiosulphate, and W is weight of sample.^[5]

Peroxide Value

Five grams of each oil sample was weighed in 250 mL of conical flask; then, 30 mL of acetic acid and chloroform solvent mixture (3 : 2) was added to each oil sample and swirled to dissolve. Then, 1 mL of potassium iodide solution was added to the solution. The solution was kept for 1 min in dark room with occasional shaking and then 30 mL of distilled water was added. Slowly, titrate liberated iodine in 0.01 N sodium thiosulphate solution until vigorously shaking yellow color was gone and after that 1 mL of starch solution indicator was added and we continued titration by vigorous shaking to release all from CH₃Cl layer until blue color disappeared. The peroxide value was estimated using the following equation:

$$\text{Peroxide value} = \frac{V \times N \times 100}{W}$$

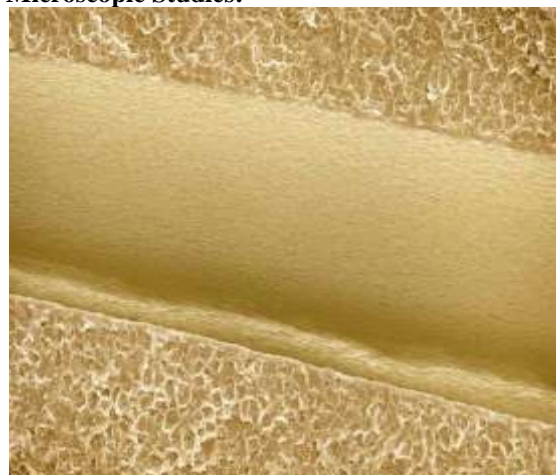
where V is volume of sodium thiosulphate, is N normality used for titre, and is W weight of the sample.^[5]

III. RESULT:

Morphological Studies:

All the morphological Observations like Odor, Color, Texture, taste etc are identical to standard observations.

Microscopic Studies:



Physico-Chemical Studies:

Refractive Index:-

1. Almond Oil:- 1.469
2. Neem Oil:-1.467

Viscosity:-

1. Almond Oil:- 0.3
2. Neem Oil:- 0.1



Determination of Viscosity

Smoke Point:-

1. Almond Oil:- 400°
2. Neem Oil:- 160°

Flash Point:-

1. Almond Oil:-93.8°
2. Neem Oil:- 54.4°

Acid Value:-

1. Almond Oil:-3.89
2. Neem Oil:-14



Saponification



Acid Value Determination

Iodine Value:-

1. Almond Oil:-95
2. Neem Oil:-70



Iodine Value Determination

Saponification Value:-

1. Almond Oil:-185
2. Neem Oil:-67

IV. CONCLUSION

Sr no	tests	Standard values almond oil	Standard values neem Oil	Test values almond oil	Test values neem oil
1	Refractive Index	1.46-1.47	1.469	1.469	1.467
2	Viscosity	34.2-37.8	142	0.3	0.1
3	Smoke Point	430	160	400°	161°
4	Flash Point	≥93	≥200	93.8°	201°
5	Acid Value	4.0	13.99	4.0	14
6	Saponification Value	180-195	175-205	185	176
7	Iodine Value	93-105	65-80	95	70

As per results all the **Morphological, Microscopical and Physic-chemical studies** of Crude Drugs, it is observed that the results are nearly identical to standard values.

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